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ANNUAL REPORT

AND

TRANSACTIONS

OF THE

PLYMOUTH INSTITUTION

AND

Devon and Cornwall

NATURAL HISTORY SOCIETY.

VOL. VI. PART I.

1876–7.

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PLYMOUTH:
W. BRENDON AND SON, 26, GEORGE STREET.
1877.

THE

LAWS

OF

THE PLYMOUTH INSTITUTION

AND

Devon and Cornwall Natural History Society.

REVISED TO APRIL, 1877.

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PREFACE.

This Society was founded in 1812, by a few gentlemen anxious to promote the cultivation of useful knowledge, to encourage habits of research, and to afford opportunities to persons of various pursuits to communicate with each other, by the reading of essays on literary and scientific subjects, and discussing the same.

The land and buildings of the Institution are vested in seven Trustees "for the delivery of lectures, and for discussions on the "different subjects of science, literature, and the fine arts; for "the formation and use of a library, collection of apparatus, and "museum, and for other the uses of the Society," subject to the laws and regulations made by the members. The Trustees (who must be members) are elected by scrutiny, and vacancies in their number (when reduced to three) are to be filled up at the annual meeting of the Society, or at any meeting convened for that purpose.

In 1851, an amalgamation took place between the Plymouth Institution and the Devon and Cornwall Natural History Society; it being considered that their objects, being nearly identical, could be better obtained by union and co-operation.

The following laws were revised at the last Annual Meeting of the Lecturing Members.

Athenæum,
13*th April*, 1877.

LAWS.

1. The Society consists of persons united for the purposes stated in the preface, and who are denominated "Lecturing Members;" these have the power of electing other Lecturing Members and Honorary, Corresponding, and Life Members, and of admitting Associates.

2. The property of the Institution, the election of Members, management of the concerns, and enactment of laws, are vested exclusively in the Lecturing Members.

3. Those persons only are eligible as Lecturing Members, who will undertake to deliver a lecture in their turn, when called on to do so by the Council, or in its name by the Secretaries.

4. Every Lecturing Member shall be elected by ballot, after an application from the candidate to the President in writing—accompanied by a recommendation (signed by three Lecturing Members) —shall have been submitted to the Society not less than seven days before the election. The ballot shall not be proceeded with unless six of the Lecturing Members at least be present, and a majority shall determine the election; but the candidate must receive at least six votes.

5. Before the candidate can take his seat in the Society, he must sign the following obligation to these laws, and to such other regulations as may be determined on by the Lecturing Members; and he must pay to the Treasurers one guinea, and subsequently one guinea at the beginning of every session, as his annual subscription.

FORM OF OBLIGATION.

"We, whose names are hereunto subscribed, do hereby severally promise to conform to the Laws of this Institution, and to such other regulations as shall be made by the Society while we severally continue Members of it."

6. Every Lecturing Member shall be allowed to introduce to the lectures a young man, between the ages of fifteen and twenty-one, on paying to the Treasurers half a guinea at the beginning of every session; and also a lady, who shall be admitted gratuitously.

7. A Lecturing Member may introduce one person to any lecture of the Society gratuitously, provided that the same person shall not be introduced to more than two lectures in a session. The introduction shall be by a written order, signed by the Member, and containing the name and address of the person introduced. The President has the privilege of introducing visitors gratuitously.

8. No Lecturing Member shall resign his seat, except by written notice, and his annual subscription shall be considered due until such notice is received by the Secretaries.

HONORARY MEMBERS.

9. Those only who have distinguished themselves in Literature, Science, or the Arts, shall be eligible as Honorary Members.

CORRESPONDING MEMBERS.

10. Persons residing at a distance, who shall have favoured the Society with any valuable communication on Literature, Science, or Art, or from whom such assistance may be expected, shall be eligible as Corresponding Members.

LIFE MEMBERS.

11. Life Members comprise persons who shall bestow pecuniary or other aid on the Institution, the value of which shall not be ess than ten guineas; and they shall have the privilege of free access to the lectures, and if not present themselves may delegate this privilege to another, who however must be approved of by a majority of the Council.

12. Every Election of Honorary, Corresponding, and Life Members, shall be by ballot, after a notice of twenty-eight days, signed by not less than seven Lecturing Members, and the dissent of one-fourth of those who vote shall exclude; half the Lecturing Members at least must vote at such election; those who sign the recommendation being reckoned votes in favour of the proposition.

ASSOCIATES.

13. Any persons, on the nomination of a Lecturing Member, and on paying one guinea to the Treasurers, may attend the lectures and join in the discussions during the session, and introduce one lady; and any lady may be admitted, on the like nomination, to the course of lectures on payment of half a guinea at the beginning of every session.

14. All members of Literary or Philosophical Societies established in places beyond five miles from Plymouth shall have the privilege of attending the lectures gratuitously, upon application to the Secretaries.

OFFICERS.

15. The Officers of the Society shall be elected from the Lecturing Members, and shall be a President, four Vice-Presidents, two Treasurers, two Secretaries, eight Curators, and two Members of Council.

16. The President and the Officers shall hold office for one year, and their election shall be by nomination and scrutiny on the last evening of the session; and they shall retain office until their successors are appointed.

17. A member shall not be eligible for the office of President, unless he shall have lectured five times; or of Vice-President, unless he shall have lectured twice.

TREASURERS.

18. The Treasurers shall, on the last evening of every session, produce an account of the expenses of the past year, circumstantially detailed, and audited by two members named by the President.

19. The Treasurers shall pay no bill until it shall have been passed by the Council.

SECRETARIES.

20. The Secretaries shall keep the minutes of the proceedings, and record the transactions of the Society, and on the last evening of every session they shall produce a list of the members, together with a written report of any new laws that may have been enacted, and of any important occurrences of the past year. It shall also be their duty to prepare the list of lectures, which shall afterwards be arranged and printed under the direction of the Council.

CURATORS.

21. The Curators shall have the care of the property of the Society, and the control of the various departments, subject to the direction of the Council; and a week before the last evening of every session, they shall deliver to the Secretaries written reports of their proceedings during the past year, stating what alterations have been made in the property respectively under their charge.

22. Should a vacancy occur in any of the offices above mentioned, it shall be filled without delay by the Council at a meeting convened for the purpose.

COUNCIL.

23. The Officers shall constitute a Council, of which five members shall form a quorum, and the President or one of the Vice-Presidents shall be Chairman. They shall receive all literary and scientific communications, decide on the propriety of inserting them in the records, superintend their publication, and manage the general affairs of the Society.

24. All recommendations of books, apparatus, &c., shall be made to the Council, and the Society shall not be held responsible for any expenditure without its sanction.

25. The Council may supply the immediate wants of lecturers in books or apparatus, or defray the expenses otherwise attendant on the lectures, if the expense in each instance do not exceed two guineas; such books or apparatus being then considered the property of the Society.

26. The Council shall meet, by three days' notice, on the first Monday of every month, and at such other times as may be found desirable. Any special business to be transacted shall be mentioned in the notice convening the meeting.

27. The Council shall continue in office until it shall have conveyed its trust to its successors, together with all inventories, books, &c., at the annual meeting of the Society.

28. The Council shall have the power of making any private regulations consistent with these laws, and may sell or exchange any duplicates or superfluous articles.

29. The Council, at its discretion, may set apart certain evenings for the discussion of miscellaneous subjects, or for original papers and communications.

LIBRARY.

30. The circulation of books is confined to Lecturing Members and Associates, subject to regulations adopted by the Council.

31. No periodical publication shall be taken from the Athenæum until the volume of which it forms a part is bound.

32. Members and Associates taking books from the Library must enter them at the time of the taking and return in a book kept for that purpose, the Society trusting to the honour of Members and Associates for so doing.

33. The Curator shall, on the application of any Member who in preparing a paper may require a book in circulation, have power to recall it for his use.

34. The Curator, with the sanction of the Council, is to order any books to be bound when necessary; he is also required to inspect the condition of the books annually, for which purpose all books shall be returned, and the Library closed from 20th of March to 1st April.

35. Members or Associates retaining a book after notice from the Curator, under the circumstances above specified, shall incur a fine of sixpence per day until it is returned.

MUSEUM.

36. No person shall have access to the Museum, unless accompanied by a Lecturing Member, or having an admission ticket signed by one of the Officers, and then only at such times as the Council shall determine.

37. No money shall be expended in the purchase of specimens without the consent of the Council, and no specimens shall be removed from the Museum without the like consent.

APPARATUS.

38. The Apparatus is for the use of Lecturing Members, and is not to be removed without the consent of the Curator. Being intended chiefly for the illustration of lectures, no Member shall keep any part of it beyond the time allowed him by the Council or Curator, under a penalty of one shilling a day for such detention.

39. The Curator is empowered to request the return of any apparatus for the use of a lecturer.

40. Any apparatus broken or injured while in charge of a Member, except during the actual delivery of a lecture, may be repaired or replaced by the Council at his expense.

41. The apparatus shall be returned for inspection at the same time as the books.

THE BUILDING.

42. The Curator shall see that the housekeeper performs the duties required of him, and occasionally ascertain the state of the building and garden and report to the Council, and give a general statement of their condition on the last evening of every session.

MEETINGS.

43. The Society shall meet at the Athenæum, on such Thursday evenings, from the beginning of October to the end of March, as the Council shall decide. The chair shall be taken in the Library, at seven o'clock, for the transaction of business; and at half-past seven o'clock precisely the Members shall adjourn to the lecture-room, when a paper or lecture, occupying about an hour in delivery, or a subject of discussion, shall be given, which shall be discussed until ten o'clock.

44. No business shall be transacted on lecture nights except the nomination of candidates, the election of Members, or the disposal of communications which may require immediate attention.

45. The day or hour of meeting may be suspended or altered by the President or Council if any unforeseen circumstances should arise, satisfactory reasons for so doing being given to the Society at the earliest opportunity.

46. All notices and recommendations, after having been submitted to the Society, shall be placed in some conspicuous situation in the Athenæum until they shall have been determined on.

47. No question or proposal having been determined once in a session by the votes of the Society shall be again revived during that session.

48. On the first Thursday in April of every year the "Annual Meeting" of the Lecturing Members shall be held, to receive the annual reports, elect the Officers, and consider any proposed alteration in the laws.

N.B. The Anniversary Meeting is held on the evening of May 1st in every year, unless the day should fall on a Sunday or Saturday.

49. The President may, on his own authority at any time, convene a Special Meeting of the Lecturing Members. The President, or in his absence one of the Vice-Presidents, shall, on the requisition of eight Lecturing Members, convene a Special Meeting of Lecturing Members to consider and dispose of any particular business.

50. No laws shall be enacted or varied except with the consent of the majority of the Members present at the Annual Meeting, or a Special Meeting convened under the last law, and in either case after fourteen days' notice to each Member specifying the nature of the proposed alteration, one-half of the Lecturing Members being required to constitute a Special Meeting competent for the purpose.

LECTURES.

51. On the first Thursday in October the session shall commence with an address from the President, or any retrospects of the progress of Science, Literature, or Art, or a lecture.

52. Controversial Theology, practical Medicine, and the Political topics of the day, are excluded from the lectures and discussions.

53. Every lecturer is required to prepare a summary of his intended lecture, which shall be read at the meeting preceding that at which the lecture is to be delivered, and also at the commencement of the lecture.

54. Every lecturer shall have the privilege of introducing gratuitously, on the evening of his lecture, six persons, provided the same persons be not so admitted oftener than three times during the session.

55. Papers by honorary or corresponding members may be read by the authors, or by any member selected by them for the purpose.

56. Unpublished papers or essays by persons not members of the Society, must be read by a Lecturing Member.

DISCUSSIONS.

57. Immediately on the close of a lecture the summary of its contents shall be read, when the Society shall proceed to the discussion of it, after which the summary of the next lecture shall be read.

58. The speakers shall stand whilst speaking, and address themselves to the Chairman.

No dividend, gift, division, or bonus in money shall or may be divided or made between any of the Members of the Society.

ADDRESS

AT THE OPENING OF THE SESSION 1876-7.

BY THE REV. S. BEAL,
President.

Mr. Vice-President, Ladies and Gentlemen,

In welcoming you to your places in this Hall at the beginning of another session, my first and pleasing duty is to congratulate you on the improved appearance of the building itself, both internally and externally. Notwithstanding all we hear about "dusty tomes" and "venerable ruins," it is not at all fitting that we should allow either our books to moulder or our buildings to decay in this practical and life-stirring age. It is reassuring, therefore, to have evidence in the renovation of this Hall and the complete embellishment and restoration of the exterior walls that we are alive, not only to our duty as a Society, but to our work as professed representatives of literature and art in the midst of this busy and thriving population. Nor can I omit to remind you that what has been done *has* been done under the able direction of one of ourselves. One of our own office-holders has given us the benefit of his ripe judgment and professional skill in making this building worthy of its object, and of the town in which it stands. We have a rule, as is well known, that every member of this Institute should be prepared, when called upon, to contribute a Paper on some topic germane to its object, without looking for thanks or expecting reward; but I hope I am not stepping beyond the limits of this Spartan regulation, when I say that we all owe thanks to the Curator of the building for the care he has bestowed in carrying out so ably and so well the duties of the office he holds, and in expressing a hope that he may long con-

tinue to occupy his present position for the benefit of the Society and the credit of those who belong to it.

Since we last separated, death has removed from our number one of the oldest and most honoured of our members. Dr. Hearder had been a lecturing member of this Society for upwards of twenty years. It is unnecessary for me to speak at length of his varied acquirements in this Address, as a memoir of his life will appear in our "Transactions."

I took occasion, when occupying this chair at our last Conversazione, to make some observations on the question of the use of opium in China. My object was to bring before the gentlemen present a matter of some importance; viz., the relation between the condition of the people who use this drug, and its extraordinary demand in China. Is there any reason to be found in the social life or circumstances of the people to account for this demand? I should not have again alluded to this subject had I been quite certain that I was not misunderstood on the former occasion by some of those who heard my words, and by others who reasoned from the reports of the address. But as I have received several remonstrances from the outside, and was also appealed to from within, as to the utility of mooting so barren a question, I feel it right to re-express my conviction that there *are* circumstances in the social life of the Chinese which partly at least account for this extraordinary craving; and if so, it appears to me that remedial measures might be suggested to meet the necessity and stay the progress of the evil. That I do not stand alone in this assumption is evident from a paper in the *China Review* (No. 6, vol. iv. p. 379), where we find the following remarks made by Mr. Charles T. Gardner, an old resident in the country. He is reviewing a work called "Chinese Sketches," by Mr. Herbert A. Giles, of Her Majesty's Consular Service. In the doing so he says:

"The poor Chinese can only get vegetables. The opium smoke which introduces the morphia in its more rarefied, least poisonous, and most effective manner into his system, makes him digest slower, and acts in the same way as prolongation of his intestines would. Again, opium-smoking is a preservative against miasma; in Lincolnshire and other places where miasma prevails, the people take to opium-eating instead of dram-drinking. Why? because experience, the best of mistresses, teaches them that opium is a sovereign specific against low fevers. Opium-smoking is as less

noxious than opium-eating as tobacco-smoking is than tobacco-eating.

"No part of Mr. Giles's book has been so fiercely assailed by the press as that on opium-smoking, especially where he says, 'where opium kills its hundreds, gin counts its victims by thousands.' This is said to be an exaggeration; we consider it an under-statement; we have very, very seldom seen drunken Chinese, and in fifteen years' residence have only heard of two Chinamen who had *delirium tremens*. We have examined into hundreds of cases of opium-smoking. We have never been able to trace a single death or crime to the practice. Mr. Giles's distinction between men who have the craving and those who have not is correct; to the latter opium does much good; it has saved the lives of myriads of persons of consumptive tendency, who would be given up by European doctors. Consumption, the dread and scourge of Europeans in China as well as at home, is not feared at all by the Chinese who smoke opium. The Chinaman lives in crowds in undrained marshy ground, badly ventilated houses, and on rotten cabbage and rice; yet the Chinese opium-smoking coolie and carter will do work and face weather that would appal our well-fed labourers. Why? The most rudimentary knowledge of physiology will tell us. Animals that eat vegetables have long, and animals that eat meat, short intestines. The length of man's intestines shows he was meant to eat both.

"Next with regard to those who have the *yin* or craving. Mr. Giles is mistaken in supposing they cannot give up the habit; it is not so difficult as in cases of dipsomania; three or four days or a week of stomach-ache, with diarrhœa, is all a man of good health has to fear; people in a bad state of body cannot give up the habit, the attempt to do so does sometimes result in death, which would in nine cases out of ten have occurred earlier if they had not smoked at all. Mr. Giles is quite mistaken in supposing that to an inveterate smoker all chance of posterity is denied. We will mention three cases that show this: one smoked opium for twenty years, has had the craving for fourteen; several children, one born in 1874; a second smoked opium many years, has had craving eleven years, has a child one year old; while a third smoked opium for forty years, had craving thirty-five years, and died at the age of sixty-three, leaving several children, the youngest of whom was seven. It is, however, so common a belief that opium-

smoking impairs fertility that we are obliged to suppose there is some reason for the belief. We have visited, sometimes alone, sometimes with missionaries, doctors, &c., some thousand opium shops in different parts of China; before we studied the question we shared the usual notions on the subject of opium, which gradually gave way as we attained further knowledge. A single anecdote will suffice. We were with a missionary whom all who knew, revered. We saw in an opium den as miserable a specimen of humanity as can be conceived; it was summer, and the being was nearly naked, hardly any flesh was on the bones. 'There,' said our friend, 'you see the effects of opium-smoking, it is needless to go farther.' We were not satisfied, and asked, What is your age? Answer, Seventy-eight. How long have you smoked opium? Answer, Over fifty years. How long have you had the *yin?* Answer, About fifty years. Why did you begin to smoke? Answer, Because I was spitting blood."

I am satisfied with these quotations, as confirming the view which I desired to place before my audience on the occasion alluded to. I had no desire to canvass the question of the morality or immorality of the "opium trade," as it is called; but I did desire, and *do* desire, to bring before the members of this Society, so many of whom are able to judge of the question on its merits, whether many of those vices called "national" may not be accounted for by peculiar circumstances, and especially social ones; and whether it is right to condemn in unreserved terms those who, in resorting to such practices, are but confirming the iron rule—"Naturam expelles furcâ, tamen usque recurret."

The vacation season of the year has been, as usual, occupied by various congresses of learned or religious societies. The most interesting to us, in a local point of view, has been the congress, or rather congressional tour of the British Archæological Association. There could not be a more interesting county for exploration, in connection with the peculiar aims of this association, than the county of Cornwall. Essentially British, it is replete with British remains. Scarcely a village or parish church but has some tradition or legend connected with it, and in many cases there are still existing Rude-Stones which carry us back through ages gone, and are therefore in every respect fit subjects for the investigation of the true archæologist.

It is refreshing to find that the old Druidical theory with respect

to the megalithic remains in Cornwall has been well-nigh given up; and yet there are many who are averse to the modern matter of fact explanation which Fergusson, for instance, in his "Rude Stone Monuments," offers us to account for the remains in question. There is a saying of Malebranche, quoted by Sir W. Hamilton in his "Metaphysics," vol. i. p. 13, to the effect that "if I held Truth captive in my hand, I would open my hand in order once more to peruse the Truth;" and so it is with many others, and especially archæologists. There is a venerable obscurity and mistiness connected with such studies that refuses to give place to the sunlight; if for a moment the clouds rend, and the mists rise, and the fogs lift; yet it is but for a moment, and back we go into the mystery and gloom of the half-solved questions which delighted the past age, and racked the ingenuity of archæologists now gone to realms of less obscurity, and free from enigmas. Undoubtedly there was a charm in the Druidical theory which converted our lithic circles into choirs or churches, and our cromlechs into altars, on which had bled the human victims consecrated to Moloch, or some other time-honoured yet blood-thirsty idol-god. But alas for the fickleness of all such self-evolved theories! Our familiarity with sacrifice made us suppose this to be the constant adjunct of all religious or superstitious worship; and as the idea of worship without an altar was inadmissible, according to the received traditional teaching of our time, therefore there *must be* altars, which were perhaps but the moss-covered memorial of some long forgotten chieftain, who in early days ruled over the territory which was enclosed by the horizon, as by a circle of fancied rocks, an idea derived probably from the cloud-gathered attendants of the morning or evening twilight, which thus became the analogues of the stones that were erected around the central spot of his sepulture. In order to place this theory in an intelligible light, I must refer to some of the oldest traditions of the human race, as they come down to us from remote antiquity; and fortunately I am able to do so with some degree of certainty, as I do not depend on mere fanciful derivations, but on the evidence of the oldest symbolical language in the world. I mean the Chinese. And I may say, before going further, that these same symbols are found here and there scattered through the world, proving that they were at first universally understood, just as it is now asserted by one of our best sinologists (Dr. Edkins), that the phonetic roots of the Chinese

language are the same as those of Europe; in other words, that the Chinese phonetic roots are those from which the languages of Europe, and therefore of India, were originally developed.

Among the earliest and simplest ideographic symbols in the Chinese language is one which resembles precisely our capital letter T, without the finial strokes, signifying that which is "above," and the converse of this; viz., the T resting on its base (⊥) signifies equally that which is "below." It is true that these symbols are not used in their naked simplicity as expressive of these ideas; but whenever the idea of "above" is to be denoted the T is drawn, and underneath it a spot is placed to signify coming down from above; and so also in the symbol for below ⊥ a similar spot is placed to denote going up from below; but this does not affect the original symbolical meaning of the two strokes, any more than the value of an ordinary sign-post or directing-post would be changed by the presence or absence of the finger carved out of the terminal point, or painted on the surface of the arm itself. Granting then the force of these two primitive symbols, which we shall find recur in every direction, I wish now to point you to another equally simple, or even more simple one—I mean the dot or tongue which indicates a spark of fire, and which occurs not only, though most frequently, in Chinese symbols with that significancy, but also in every language and in all nations. We little suspect, I imagine, when we dot our "i's" what that dot means, any more than we do when we cross our "t's," or when (as on the cover of the *Graphic*) we place a dot or tongue of fire over the angel or divine messenger to signify his more than human character. This dot, as signifying fire, is clearly pointed out in the symbol for fire itself in the Chinese language, and it is this, *a piece of wood boring into another piece*, and *on the opposite side a spark issuing*, indicating the generation of fire by friction, thus ·)< Now the dot, as signifying "fire," was placed, as Agui was by the Indians, in a place of pre-eminence over the visible world; hence, connecting this idea with that of the former, viz., the symbol for height or heaven, we have the complete idea represented, symbolically, of the supreme power pictured as fire or a spark presiding over the lower world, and so placed above it. Now this symbolism is visible everywhere. In Egypt we find the well-known "key of the Nile" in the hand of Isis—about which there has been so much speculation—denoting simply the supreme power

exercised by that divinity; the same symbol in China denotes the supreme Lord or Ruler of the universe, and is in fact a part of the expression used to signify "God." We have here then one of the earliest inventions of man by which is denoted something "above" that which is visible to the eye, or "*heaven*." Now let us put this idea in stone—for I need hardly say that all the leading features in architecture are embodiments of simple ideas—and we find that the first and simplest effort to express the thought of heaven in stone would take the shape of the T; or, from the impossibility of constructing such a figure in permanence—the figure of the trilithron, or superimposed lintel on the two upright posts. Above this we find in Indian the chatta, or tee, as it is called, corresponding to the supernal world, denoted by the superimposed flame or spark. Now this may appear far-fetched and wire-drawn to some; but I believe, from wide and impartial comparisons, that it is not so; and I cannot but look upon the early forms of our own cromlechs and dolmens as attempts to represent the idea of the world in which we live, surmounted by another heaved up above it, and which we call *heaven*, to which the spirit of the departed hero buried beneath its canopy had gone after death. And then, with regard to the circle of stones surrounding this primitive structure, we here enter on another and a well-established line of argument derived from Eastern sources. It may not be generally known from what origin we derive our familiar word *sovereign*, in the sense of king. I may, by explaining this, illustrate the subject I have in hand. One of the earliest myths we derive from the East is, that there have arisen at intervals a series of universal rulers or monarchs, under whose benevolent sway the entire world has been brought into a state of peace and lasting prosperity. These universal monarchs, because they ruled over the world, were called *Chakravartins; i.e.* "those who possessed exclusive sway within the circle of rocks supposed to enclose the world (or, sakwala)." The chakravartin means simply this, "the ruler in the circle." In process of time these chakravartins were divided into three sorts; viz., those possessed of undivided or unlimited sway, who were termed *Suvarna Chakravartins* (*i.e.* golden rulers); those possessed of a more limited power were called rulers of the copper circle; and those of a less power still, rulers of the iron circle. It is possible this may have been a later invention; but there can be no doubt that our own word

sovereign, both as a gold coin and a supreme ruler, derives itself from this Sanscrit word *suvarna*—in the first place denoting the highest or most valuable coin of the realm; and secondly, as indicating the supreme power of the Ruler of the realm, termed the *sovereign*.

It will be plain then why the tomb of a sovereign should be surrounded by a circle of stones, and in some cases by three concentric circles, as a token of the buried monarch's supreme power. Hence it is probable, as Mr. Fergusson says, that many of these stone circles denote the scene of important battles, in which kings and great leaders may have fallen, and their tombs indicated, as well as their dignity and personal majesty, by the size or multiplied form of the circles surrounding their graves.

All this is in keeping with the known symbolism of the Indian Topes, which were undoubtedly tombs surmounted by the symbol of the super-terrestrial world, and surrounded by circles of well-wrought stones; and it is difficult to suppose that such marked resemblances in the East and West were altogether accidental. I may here perhaps be permitted to make an observation on the meaning of the word *tee*, which is so frequently used to designate the surmounting umbrella-shaped structure on the top of the tope or stupa, and to receive which perhaps the hole on the top of the dolmen was designed. It is not generally known that this word is the corruption of the Pali "khettiya," signifying "a world" or "an earth," just as in the north the same word is rendered *tsàh*, from the Sanscrit *kshetra*, with the same meaning; from all which we gather, what indeed cannot be disputed by any one who has carefully considered the subject, that all these structures, whether dolmens, stupas, or topes, represent the lower world, whilst in the developed form of the same buildings the *tee*, or *tsàh*, symbolizes the worlds or earths supposed to exist in superposition to our own; in other words, the mansions of heaven.

Whilst speaking on the subject of the origin of these rude stone megalithic remains, and endeavouring to trace them to an attempt to imitate what is seen in nature, I may also allude to another form of the same kind of natural imitation; I mean this, that when men began to leave the rude stone form of building, and erected pyramids and topes, they also followed a natural and most simple rule. It must be evident that, to a builder, the most striking example or imitation would be the work of the *Great Architect*, "who

stretches out the heavens like a curtain, and layeth the beams of His chambers in the waters." (Psalm civ.) Men would strive, especially in sacred buildings, to imitate, both in shape and proportion, the figure and measure of the material heaven, resting on the earth as its foundation. The effort would be, I say, to erect a building to resemble the dome of heaven, with its parts in the proportion of that dome to the line of the earth on which it seems to rest. Now I have tried to prove elsewhere,* in a way which has not been disputed, that all the domed buildings we meet with in India and elsewhere *are* intended to be imitations of the material heaven, or, in other words, of the visible universe. It is evident that the chief proportion aimed at in the erection of such a building would be that which exists between the base on which it stands and the hemisphere erected upon the base; in other words, of the diameter to the semi-circumference. Unfortunately in India the stûpas are so dilapidated that there is no exact measurement possible; but yet we have an approximate calculation which brings the matter almost to a certainty in the case of the stûpa at Sanchi, where the diameter of the base is 110 feet, and the height of the truncated hemisphere 39 feet; but the erection placed on the top of this dome, together with the chatta, may be calculated to have been about sufficient to raise the entire height to 54 or 55 feet; *i.e.* to half the base.

This theory is very much confirmed by what we actually know of the structure of the Great Pyramid. Mr. Smyth, in his work on this wonderful building, has calculated the dimensions with considerable accuracy, and he gives as one of his results that the height of the pyramid is to twice the base as the diameter to the circumference; but this may be reduced to the simpler form of h : b :: d : $\frac{1}{2}$ c. That is to say, in the early days, before the great builders or masons had acquired the knowledge of dome structure, they still adhered to the ratio of the diameter to the semi-circumference for their height and base. But perhaps the most singular analogy to be observed in this comparison is that to the top of the king's chamber, so-called—which I take to be but indicative of the highest point of the visible heavens—from the central point of the base is exactly half the side of the square, measuring the extreme limits of the internal structure; in other words, whose length is a line connecting the highest point of the

* "Journal Royal Asiatic Society." Article, "The Great Tope of Sanchi."

aforesaid chamber with the lowest point beneath the low-water level of the Nile. We thus get the normal proportion of radius to diameter for the *internal* construction of this very ancient building.

I should like to observe, whilst on the subject of the Great Pyramid—undoubtedly one of the most suggestive of all ancient buildings—that the tripartite division observable therein, viz., the sunken well, the queen's chamber, and the king's chamber, with the crowning part above the last, culminating in the head-stone, or, as it is called, the stone of stumbling, exactly corresponds to the well-known division in Eastern architecture of "heaven, the region of the gods," the "sub-celestial region of the demigods," and of "the subterranean regions of hell;" and I am inclined to believe that this division is the secret of the internal structure of the pyramid. Let me only observe finally that the name of the curious construction known in our own Gothic architecture as the *crypt* is only a Greek form of the Anglo-Saxon *hell*, and corresponds entirely to the subterranean vault found under the pyramid, and also supposed, in theory at least, to represent the place "of the dead," as hades or hell, or sheol, in other religious systems.

I intend to dwell no further on this part of my subject, as it relates to the connection between our rude stone monuments in Cornwall and the most perfect of all buildings, the pyramid and stûpas of India, derived from a mutual agreement with some of the first principles of the natural world, but to pass on at once to another subject of considerable interest at the present moment. Before doing so, however, I may perhaps be allowed to raise a question of some interest to us locally—I mean the correct derivation of the word *Dosmerry* in "Dosmerry Pool." To say that "doz" and "muir" mean, in Scotch Gaelic, "drop" and "sea" would scarcely satisfy the requirements of Celtic grammar in words placed thus in government. We could only have "na-muir doz" for drop of the sea. Besides this, the *raison d'etre* of such an origin appears wanting; for why Dosmerry Pool should be more a drop of the ocean than any other pool, is not so evident; but if we derive it from the true British *dur* = "water," and *smaire* = "black," and thus get a compound, "Dursmaire" or *Black Water*, we have at once a grammatical compound, and also a true descriptive title of the pool itself. I need only remind you that this title of *Black Water* is constantly given to deep and

smooth pools, as, for instance in the river Stour, to a portion of it which flows just at the back of Hern Court, the seat of the Earl of Malmesbury, in Hampshire, and in many other cases. And it is well known to every Cornishman that the ordinary pronunciation in the county of our word "smear" is "smare," and also that the British for "blackberry" is also this same word "smaire." This, taken in connection with the fact that the people call the pool, not "dozmerry," but "durzmerry," will, I think, confirm the derivation I have ventured to suggest. I could have wished that some archæologist of the county had told us something about one of the oldest saints in the British Calendar—I mean St. Add or St. Œth. The parish of St. Teath is evidently connected with this saint; and there is reason to suppose that the name is incorporated in such compounds as "Staddon" heights, "Llanstaddwell," and perhaps in "Caer Edin," and also our own "Caradon." This word, which is a very primitive one, and easily discovered in various compounds, may be traced back to the old root represented in the Greek by "χθων," in the Semitic languages by "heth," and was probably the origin of our own word "heath," and hence "heathen," signifying the soil or native ground of the inhabitants of every country. Being brought into the list of Christian saints, like St. Goven or St. Kifin, signifying a "headland," it came to be regarded from a purely Christian ground, and its origin was forgotten.

I pass on now to make a few remarks upon a subject brought under the notice of one of the sections of the British Association, and which is assuming such a character and claiming such attention in our midst that it would not be right altogether to ignore it—I mean that which is commonly called Spiritualism. I shall not pretend to follow either Professor Barrett, or Mr. Wallace, or Dr. Carpenter, in their remarks on this subject. What I wish to say is this, that there is no need to question the possibility of certain phenomena produced by some agency, or the exercise of some power unknown to us; but there is no authority whatever worthy of the name for connecting these phenomena with what is called the spiritual world. We may dispute *à l'outrance* the existence of such a world—I mean from a scientific standpoint; there is no evidence whatever of its existence. We have a right to demand not only the *ubi*, but the *quomodo* of such existences as spirits; whereas if the evidence of such existences be referred

to religious, or rather Biblical authority, the question ceases to be a scientific one, and becomes part of the domain of Faith, with which we are not immediately concerned. I repeat, from a scientific point of view, we know nothing about "spirits," so-called; to say that a spirit can knock is just as contrary to all experience or possibility of conception as to say that a man can fly. There may be knocks, and there may be other phenomena, exhibited beyond the power of dispute; but I still fail to understand by what right these phenomena are referred to the interposition of spirits. In fact, whilst it is quite within our power to conceive that there are laws and forces in the world around us of which we know nothing, it is not possible to conceive that a hand without flesh or blood can hold a pencil, or a being without body, parts, or passions, play on a guitar, or sing a song. The power which the will, entirely intent on this one purpose, and cleansed or strengthened by ascetic austerities and mortification of the flesh, may have on matter or others' will, except its own, is one thing; but that it exercises such power by the agency of spirits is altogether another, and requires positive proof before it can be even admitted as an element in the solution of the question. In making these remarks, I am only stating a difficulty which has always offered itself to my own mind, not with a view to stifle the inquiry, or even change its aspect, but to show how it is impossible to consider the question seriously in the light so grotesquely lent to it by the interpellation of something we are supposed to know all about, yet about which we are in absolute and complete ignorance.

I wish, lastly, to call your attention to the Congress of Orientalists recently assembled at St. Petersburg. It is well known that this Congress was the third of the kind held in Europe. The choice of St. Petersburg as the place of assembly was carried by a considerable majority of the members of the Society in London in 1874. And perhaps not unwisely, for half Russia is in the East; its territory extends in a direct line from Finland on the one hand to Japan on the other without a break, and therefore no country has so great a claim to be consulted in the examination of all oriental questions. But besides this territorial advantage, Russia has long enjoyed the reputation of possessing one of the best endowed Universities and most extensive Oriental library in the world; I mean that of St. Petersburg; so that on every account the selection of this city for the Congress of Orientalists was a happy one. One important question

raised during the session was as to the cause of the decrease of those immense populations of Central Asia which once desolated Europe, and in one sense overran the world. M. Wassiljew explained that it was not from Siberia or the adjacent region that these invading tribes issued forth, for Siberia has always been thinly populated, but from the central plateaux of Mongolia and Northern China, and that the course they almost universally followed was along the northern and southern slopes of the great Thian Shan range into Songaria, where they were joined by the populations of the rich alluvial countries bordering on the rivers Talas and Chu, and thus advanced either northward into Europe, or southward into India and Persia. As to the decrease of these populations, that is to be attributed mainly to the wide prevalence of the Buddhist religion throughout the regions referred to above. As is well known, the followers of Tchenggis Khan were as yet unconverted to that religion; but shortly afterwards its influence extended among them, and throughout Thibet and Siberia; the consequence was a rapid diminution of population. This may be understood if we only consider one statement made by M. Wassiljew, that in the monasteries of Pekin alone there are upwards of 100,000 priests, all of whom are condemned to a life of celibacy, and that this is by no means an isolated case, but that throughout Mongolia, as in China, these monasteries are equally crowded with priests. It may easily be understood how this state of things, existing during one thousand years, has materially interfered with the increase of the population of these countries, and freed us in consequence from the pressure of the barbarian element on our frontiers, which in former ages was the dread of the Empire which it eventually overturned. So far we owe something to Buddhism. M. Wassiljew also explained what has hitherto been a doubtful question respecting the religion of the Siberian aborigines. Of course Russia has succeeded well-nigh in bringing all these tribes into obedience, nominal at least, to the Greek Church; but yet there lingers amongst them that mysterious Shamanism of which we read so much and understand so little. M. Wassiljew explained that this expression is but a perversion of the word Sramana, which means a Buddhist ascetic, and that when the missionaries of Buddhism penetrated into these inhospitable regions, the name was adopted to indicate the fusion of their doctrine with that of the fetish worship of the people amongst whom they laboured. The Shamanism therefore of Siberia is but

a degraded form of Buddhism, which cannot claim any respect for itself as a religion, or for any time resist the advance of a more elevating belief, though perhaps one not wholly free from superstitious observances. A most curious question was revived at this congress as to the probability of the discovery of America by the Chinese. There exists in China an itinerary of some Buddhist priests, which has been translated into English by Professor Charles Fried. Neumann, and lately republished in America, from which it appears that about the year 430 A.D. a Shaman, *i.e.* a follower of the Buddhist faith, returned to China from a country called Fu-sang, which he described as being about 20,000 li., *i.e.* about 4,000 miles to the eastward of the country of Ta-Han, *i.e.* China, and he stated that the place abounded with a plant called Fu-sang, the fruit of which was red, of the shape of a pear, and supplied the inhabitants with food; from the bark of the tree they made their clothes and other fabrics. "The people," he said, "are of simple manners and peaceably inclined; they have oxen with long horns; their vehicles are drawn by stags; there are many mines, and much copper, but no iron; gold and silver are not much valued; they worship the spirits, at morning and evening, under the figure of images placed on high pedestals; they wear no habits of mourning." In consequence of this account, in the year 458 A.D., five Indian priests set out for this country, and with their books and images arrived there safely, and finally succeeded in introducing the ritual and monastic orders of Buddhism amongst the people.

It was Deguignes who first started the idea that this Fu-sang was Mexico. The fruit of the *petahaia* is red, and like a pear. From its bark the Mexicans make their clothes. The country abounds in vines and stags. The people were undoubtedly of simple and peaceable manners, and the distance from China may be roughly calculated at four thousand miles. There was much to be said in favour of the theory. It was therefore taken up by Neumann, and since his translation it has found acceptance in America. We cannot be surprised therefore that the enquiry was revived at St. Petersburg. But, like all questions of this sort, based on mere conjectural evidence, no satisfactory result can be expected. The journey from China through Siberia up to Behring's Straits appears altogether beyond the possibility of accomplishment by five uninstructed and ill-provided Buddhist missionaries; and then to cross over into the inhospitable regions of Alaska, and find

their way down to Mexico, unhurt and in apparent every-day health, is a feat so incredible that we may well set the matter at rest by consigning the whole narrative to the region of the fabulous. I will only add that this matter has been taken up fully by a French *savant*, M. D'Eichtal, who believes in the correctness of the theory, and brings evidence from sculptures in Mexico to show that Buddhism had diffused itself at an early date through the country, and that it was introduced there by Chinese priests.

Were I not afraid of tiring your patience, I would allude at length to the valuable remarks respecting Japan and Japanese literature made by M. de Rosny at the Congress. Suffice it, however, to say that he agrees entirely with the opinion, held amongst others by our associate Mr. W. Copeland Borlase, that the population of Japan is not purely Mongolian, but that there is a mixture of a northern immigrant race with the southern conquerors of the country, which has resulted in a mixed population, where both types are plainly observable. Perhaps we may thus account for the marked character of the people themselves. Brave and courteous by nature, they are also full of northern energy and practical genius. They are already beating some European countries in post-offices and iron-clads, and they can mobilize an army of twenty or thirty thousand men with perhaps less trouble than it would take some of us to do the same thing in case of sudden emergency. What the future of this people is to be depends very much on the foresight and prudence of their present rulers. They may hurry into a wild communism; they may advance steadily towards constitutional liberty. In the first case, there will certainly be a reaction, and the work of the last twenty years entirely overthrown. In the second, Japan may become the free England of the East, and the harbinger of a new order and revived prospects of usefulness for her neighbours in Corea and China.

With regard to her literature I will say very little. I have had enough to do lately with one small section of it at least to weary myself as well as others of the subject; but I cannot but allude to the remark made by one of the speakers at St. Petersburg, that there is no country in the world where literature is so cheap, and generally so well prepared, as in Japan. The people are essentially a book-loving race; and from the child of five or six, who has his illustrated "Puss in Boots," up to the grave master of sixty, who studies the mysteries of Confucius, there is no class but

is provided with material suitable to its wants for study and delight in the field of literary adventure.

It was my intention, had I been present at St. Petersburg, to have brought before the notice of the members of the Congress the explanation of a world-wide myth which I think I have discovered. I allude to the myth of the Solar Bow. We know that Apollo is always spoken of as the god of the silver bow. But besides this there are three celebrated personages who have been identified with the sun, each of whom has this bow-myth appended to or intermingled with his history. In the celebrated epic of the Ramâyâna we have the history of Râma (*i.e.* the Sun) seeking for his affianced wife Sita (*i.e.* the ploughed land), and only able to gain her hand by the proof of his strength and skill in drawing the celebrated bow of Janaka. Again, we all remember that Ulysses, who has been in his wanderings identified with the Sun, proving his claim to be Penelope's husband by drawing the bow which she had stored up in her well-locked treasure-house. And lastly, Buddha, again "the Sun," gained the hand of Yasodhara his wife by drawing the bow of his father Sinhahanu (*i.e.* the lion-jaw), which none other was able to lift. Now what do these bow-myths point to? It seems to me that one of the earliest phenomena which men would observe, with a view to fix the seasons and settle the time of year, would be the course and shape of the sun's shadow cast by a gnomon. It is well known that in the earliest of the Chinese classical books (viz., the *Shoo-King*) there is especial mention made of the orders given by King Yaou to his ministers Ho and Hu to go forth and measure at the four quarters the sun's shadow, in order to fix the seasons, and enable the emperor to issue commands for the planting of seed, or the ploughing the land. Again, the *Sûrya Siddantha*, which is an old book of astronomy in India, is largely occupied by rules for ascertaining the length of the sun's meridian shadow at different times of the year. Once more, in Ceylon the rule for eating at noonday was to be interpreted according to the length of the shadow; so that, not to bring other instances, it is abundantly evident that great attention was paid in early days to the figure of the sun's shadow during different seasons of the year.

Now if we, by means of some such rough instrument as that before you, which I will venture to call a *skiagraph*, trace out the shadow as to its shape for any given latitude, say 30° N., during

the year, we shall find that from the time of the winter solstice to that of the summer solstice the shadow changes exactly from the figure of an unbent bow to that of a bow fully and strongly drawn. What is this but the sun, as he increases in strength, pulling his bow, and proving his heroic might by doing that which no other power can do, and so gaining the hand of his much-loved Sita, the earth-fruits, or Yasodhara, or Penelope, as the reward of his prowess?

I am satisfied that this is the true explanation of the myth, and I consider myself happy in having been able to mention it here first, however insignificant it may appear, as the place in which these matters may be discussed with safety, and as the opportunity afforded me is a favourable and auspicious one.

Ladies and gentlemen, I feel I have already detained you too long by these discursive remarks; let me conclude by congratulating you on the prospect before us of a very pleasant and instructive Session, and thanking you for your kind attention during the time occupied in addressing you this evening, I will conclude in the words of a very ancient hymn found in the East: "Come together! speak together! Let your minds be concordant; let your endeavour be the same; let your mind be the same, that it may go well with you."*

* *Vide* Prof. Max Müller's Inaugural Address before the Aryan Section of the Second International Oriental Congress, held in London.

THE HEDGE-BANKS OF DEVON AND CORNWALL.

ABSTRACT OF PAPER BY MR. THOMAS ADOLPHUS CRAGOE, F.R.G.S.

(Read October 19th, 1876.)

Before the busy hum of feudal life had first gathered round the now mouldering castles of the Plantagenets—ere yet their gray turrets had chequered the English landscape—many of our west-country hedges were undoubtedly green with ivy, as they now are. They antedate our Henries and our Edwards, and the Norman churches have crumbled to dust by their side.

May we not even trace them back to the dim era of Saxon encroachment? Are they not lost in the mists of British dominion?

History tells us, that long before the coming of Cæsar the Britons had, in the south-east and also in the south-west of the kingdom, "made the first and most requisite steps towards a civil settlement, and had there, by tillage and agriculture, increased to a great multitude." Britain was called by the early Greek writers the "Court of Ceres," and the fertility of Damnonia is by them particularly recited.

In after times Strabo and Diodorus of Sicily unite in their report of its fruitfulness; and that the soil gave such increase without the aid of human labour, "long and perseveringly employed," it is impossible to believe.

Strabo speaks of gardens near the British houses in the south; and the number of towns along the south-western shore mentioned by Suetonius sufficiently affirms the population; whilst from remote times the Britons managed beehives and orchards, had cornfields and cattle. They were not always the mere pastoral vagabonds of the schoolboy's crude fancy, but skilful workers in metals, who made their own armour and chariots, and maintained seminaries of learning at the public expense, which were sought from beyond the sea. Now, we can imagine neither garden nor cornfield without a boundary; nor can we believe that such a people, content with

the stake and the wattle, never attempted or were unequal to the achievement of a solid hedge.

Rather, was not this last, from the requirements of the times, the very thing they would be most likely to build?

That there were fixed boundaries in the south-west we have reason to believe from *primitive names of places*. Celtic words in the English language are few, but Celtic names of places abound; so that what is wanting of the ancient tongue in the grammar, is as it were, in the extreme south-west, almost made up in the geography.

The oft-recurring prefixes of "caer" and "ker," which have in a manner weathered the storms of time and fate, and stick fast to this day, can point to but one conclusion, that those who gave the names had marked in some indelible way the lands their syllables yet cling to.

Hallam questions whether some English hedges may not be among the most venerable relics of this country.

The remark would scarcely apply to the quick-set fences of the midlands, through which dragoons might charge without brushing the dust from their boot-tops; but in the south-west of Britain, all through that tract of country once peopled by the Damnonii, we encounter hedges that would stop a cannon-ball—rural ramparts wide and high, before which the lightest cavalry that ever pressed a spur must pause, and where the heaviest would be equally powerless; and here you are aware it is exceedingly difficult to remove a neighbour's landmark.

How very ancient some of these landmarks look! Whether it may be the green mound deep sunk in the soft vale below, or the gray parapet of granite boulders threading its way towards the upland tor.

We look at them clustering round the old homesteads along the country-side, and of the times of their origin we feel we are ignorant; but wherever the scattered dates may lie, of one thing we are certain, that through all the English shires there are no older marks of the first husbandmen, nor any hedge of any kind stamped with a deeper impress of antiquity than that which crowns the venerable front of the massive earthwork of Devon and Cornwall.

Now, that this remains a feature of the soil nowhere else but in the south of Ireland it might be hazardous to assert in the face

of a travelled audience; we are not sure but something like it may be seen in La Vendée, and other parts of France contiguous to La Rochelle; but that helps our theory. We believe that earth-mounds sometimes occur in the northern marches—along North-umbrian dales; they may be found elsewhere; but this we do know, that these hedges, whether built by Celt or Saxon, are found in Waterford, Cork, and Kerry.

Whoever may traverse the valley of the Suir will see again, not only the Devonian hedge-bank, but the farmhouse of the very oldest type extant; of which a few yet remain in Devon and Cornwall, outstanding relics of the days that are dead. Moreover, it is a singular fact that several plants of the "Green Isle" are found in West Cornwall, such as the Irish heath and the Hookeria moss, which occur nowhere else in Britain.

Again, in the south-west of Ireland crop up at intervals some species identical with those in the Asturias of Spain; this intimates a kindred flora, and, it is thought, points to the time "when a great continent stretched across the Atlantic from Spain to Ireland, which must have included the western extremity of England, for several of the plants found in the British Isles—only in Cornwall and Devon—are natives of the Spanish Peninsula."

Then may not the old homes and older hedges of County Waterford, so much resembling those of West Britain, point to the kindred races of the sister isle who fought the Saxon in the Arthurian age, and left their landmarks upon Damnonia in lines wide-spread and self-enduring? because, yearly renewed by nature, they are almost perdurable, and, by the hand of time alone, nearly as ineffaceable as nature herself.

In short, is it not a Celtic picture? May not both the one and the other be a sign-manual of that diminished but immutable family, whose offspring in the wilds of Connaught to-day will curse the Saxon in *the same words* which his forefather used thirteen hundred years ago? Not that we need suppose the Saxon settler had no hand in the work; for doubtless some of our hedges rose with "the settlement itself—the 'Cote' or the 'Worthy'—whose primitive name tells us at once that it was founded in the earlier days of Saxondom." And strangers in the west-country, from that day to this, have conformed to the west-country fashion; but the followers of Hengist and Horsa did never *originate* a system so different from that "which usually marks the Teutonic settle-

ment in Germany as in England," and which the great kingdoms of the Heptarchy so signally want.

It may be asked, Why, if these massive hedges belong to the British economy, are they not found through the country at large? Must we suppose the Roman legions or Saxon hordes levelled them elsewhere?

Now that question equally applies to any other period of time: you will see this astute inquiry gather strength as it rolls along. Suppose it were affirmed that these hedge-banks first became a feature of the land—say in the twelfth century—would you not wonder what the twelfth-century folk were about, building away so busily in one corner of the kingdom?

The question becomes more urgent than ever, and less unanswerable than before. Why were these sturdy labours confined to Devon and Cornwall? You say the Atlantic winds may have something to do with it. That will scarcely do; for in the sheltered valleys the most ponderous earthworks are found. More likely it was an outcome of the peculiar genius of the Cornu-Britons, some of whom passed over to Ireland during the Belgic invasion.

But in whatever age, or by whomsoever built, how beautiful, how interesting, and how useful too, are these substantial legacies of the long past! Sweep them away, and the flora and fauna of the west would to some extent be changed.

An old Devonshire hedge—a venerable earthwork, over which have rolled the summer suns and winter storms of centuries, "from the days of the Wolfhard or the Godwine who first raised it," whose sides are so well guarded, so closely embraced by the roots of oak, and ash, and hazel interlacing each other, which renders the rustic edifice incomparably stronger than it was the first day it was built—such a mound has become a trusty guardian, a natural fastness of the country-side, a sheltered home, a chosen habitat, for plants and insects, which invest the old hedge-bank with an interest and a peculiar spell of beauty at every season of the year.

The periwinkle grows wild in Norfolk woods, and we have found an occasional patch or two trailing over the Cornish hedge, far from any habitation; but no doubt it marks the site of some ruined cottage, and in this case is merely a garden flower run wild. The strawberry seems to find its native place on the west-country hedge-bank, and is mentioned by Thomas Fuller (about

the time that Hopton's horse surrendered at Tresilian Bridge) as abounding in the "hollowe highwayes" of Devonshire. The soldierly foxglove makes a dashing appearance on the hedge-bank, sometimes a mere scout, and sometimes cresting the ridge in fair battle array. On the hedge-bank the early primrose and the violet are followed by the snowy stitchwort, red robin, and blue bell, until the meridian beauty of May and June culminates in the wilding rose and flaunting woodbine, which in their turn are succeeded by the berries and nuts of brown September. Even winter, if he takes a grace, lends a charm peculiar to his sombre reign; and under the friendly lee of some old earthmound, "which time has half-mouldered, half-clothed into so great beauty," the hedger or the woodman often takes his simple meal, where, cheered may-hap by the noontide sun, he enjoys for one short hour the sweet solace of pasty and pipe.

In later times it has often been asked whether these bulky hedges of ours are worth the room they stand upon. In discussing the question, and expatiating upon "so many acres gained," we must also remember the "per contra" in the very tangible shape of shelter, fodder, and fuel. The glorious woodfires of the old-fashioned chimneys throughout the country are mainly supplied from these hedges.

On sheltered farms through the winter months cattle glean a great part of their sustenance from the hedge-side twigs and grass; and the shelter these wood-crested earthworks afford to *both cattle* and *crops* in winter and early spring, and the grateful shade they offer the panting flocks in summer, have never been popularly made known or fairly computed, simply because they have been so long in the land!

The early potato crops of the west are more effectually protected by the multiplication of light fences than by any other device; they cut the draught.

And is it wise "to add field unto field after the modern, but not the picturesque or homely fashion"? Is it wisdom to make small farms into big ones? That policy has never answered in the history of the world.

In England it is no longer a question with thinking men, whether small holdings or large ones may be most prosperous to a state, for the truth has long been patent. It lies in a single sentence—a man will work harder for himself than for another.

Baking upon the hearth is a time-honoured custom. Sarah of old made cakes in that way; the ancient Britons did so; and the Arabs *do so* to this day. May we add, the art is not "clean forgot" in the two south-western counties, where the hedge-side bramble answers the purpose of the moorland peat and the prairie buffalo chips.

The grass which most affects the hedge-banks in Devon and Cornwall is the wood fescue (*Festuca sylvatica*) of Knapp (revised edition, 1842,) Hudson, Withering, Martyn (*Flora rustica*), Sibthorp, and others.

This grass is the wood shortfoot (*Brachypodium sylvaticum*) of Gray ("Natural Arrangement of British Plants," 1821), and the *Bromus sylvaticus* of the "Linnæan Transactions."

A very singular change attends the Timothy grass (*Phleum pratense*) when by any chance it becomes located in the dry hedge-bank; the root, fibrous naturally, then becomes bulbous.

Mr. Ruskin says a foot or two of an ordinary hedge might, to a reverent and contemplative mind, afford busy occupation for months; and really there is scope for much reflection beyond that afforded by its natural spoils; for the hedge-bank is often a repository of relics, whether it be the ancient shoe-buckle or brass button of huge periphery, fragments of early porcelain, or perchance the large-stemmed, thick-bowled fairy-pipe.

Perhaps Tacitus was not the first to observe the influence of clime and soil upon the body and mind of man. Undoubtedly the idiosyncracy of a people is to a great extent impregnated and moulded by their surroundings, and the features of the country at last become the features of the mind.

> "So the loud torrent and the whirlwind's roar,
> But bind him to his native mountains more."

And it may very well be a question whether the homely, thrifty character, and somewhat concentrated affections, of the west-country people may not at least have been intensified "by the inclosing and protecting influences of high hedges and steep banks."

There is nothing that carries a more cheery and sunny influence along with it than a true Devonian cottage garden. The sight is in itself a cordial; it goes straight to the heart!

What an air of security and comfort pervade the sweet spot! and how the spicy potherbs—rosemary and thyme, marjoram and mint—become the place! There range the beehives, edged round

with marigolds; and close at hand is the flower-knot, with its balm and heartsease, and dark single warriors from orient lands, breathing forth perfume.

Here the tall hollyhock, "outlandish rose," laughs in the pride of summer, whilst at its foot true love lies bleeding. Near the wicket is a sweetbriar; in yonder corner a lavender bush; and here is the rose of a hundred petals. This protecting hedge has been deftly wattled over and over again by "the rude forefathers of the hamlet;" its steep sides are clothed in green tapestry—an ivy mantle soft and deep—the interlacings of a hundred years; and through this thick tangle, as we have often seen, the pure snowdrop lifts its gentle head in early spring, and high above all, in sultry summer,

> "The creeping honeysuckle weaves
> Its yellow flowers and verdant leaves."

Where are the long-drawn vistas of your classic parterre by the side of this humble paradise?

Why it is a charmed circle, of which the green hedge-bank is at once the guardian, the boundary, and the talisman.

One word for the Devonshire lanes. They were so bad in the reign of Elizabeth that Sir Walter Raleigh declares, in one of his reports, that ordnance could not be drawn by horses from Exeter to Plymouth.

MIND AND CONSCIENCE IN OUR POOR RELATIONS.

ABSTRACT OF REV. W. SHARMAN'S PAPER.

(Read October 26th, 1876.)

The lecturer said, the poor relations about whom he was going to speak were the lower animals. The lowest organization of which they could confidently say, "It has life" shared with them, in its own degree, the possession of that regnant force which all other forces served, and which must be for ever the ultimate problem of science. In all sentient being they saw that which said to philosophy, "Thus far, and no farther." Carl Schmidt, the distinguished German evolutionist, did indeed assert that consciousness might be an attribute of matter, or might appertain to

the nature of atoms; and held, following Von Göllner, "that if by means of delicately-formed organs of sensation it were possible to observe the molecular motions in a crystal mechanically injured in any part, it could not be unconditionally denied that the motions thereby excited took place absolutely without any simultaneous excitement of sensation." But that astounding speculation seemed to be composed of the stuff that dreams were made of, and to be utterly unworthy even of association with the name of science. They had ample ground in experience for the belief that sensation was the exclusive property of living, mental creatures; and they had further the right to assert positively that no increase in the power of their vision would enable them to see a sensation even in a sensitive creature, much less in a crystal. Suppose that they could discern with their eye the atmospheric waves on which floated the music of a song; and suppose that they could see also every nervous vibration caused in the auditory nerves by the beating of those waves on them, what then? Would they see a sensation? No; they would see only the preliminary conditions of the sensation, which itself would remain as invisible to the eye as the song or the thoughts aroused by it. Sensation could never be regarded as an attribute of matter, but must be always thought of as a mental property, and as affording proof of the presence of mind. In it the consciousness of self, and not self, had birth, and by it thought was excited, experience gained, habit formed, and wisdom acquired. Only by faithfulness to the reception of this "great dualism," this radical contrast between life and death—a faithfulness enforced by Comte—did a really scientific and social study of nature become possible. After defining and discussing the terms mind and conscience, the lecturer said those who denied to animals the possession of reason and morality usually entrenched themselves behind the word "instinct." The communism of the ant, the geometry of the bee, the architecture of the beaver, the intelligence, fidelity, sympathy, and devotion of the dog, and the wisdom of the elephant, were to such persons merely manifestations of a blind instinct. Instinct he regarded, to quote George Eliot, as "heritage from treasure stored by generations past in widening chambers of receptive sense." All mental action, even that which was now automatic, began in mind, and was voluntary and intelligent in its inception. They could observe in themselves actions grow into unconscious habits, and could see those habits

reproduced as instinctive acts in their descendants. He was fortified in this view by the high authority of Mr. Darwin. All instinct had thus, he believed, a mental voluntary origin, and much of it had probably a far closer connection with the conscious mental and voluntary activity of the individual animal than was commonly supposed. Knowledge of extension and duration was acquired slowly by all domesticated animals, and even in insects and in birds experience seemed to add to and modify instinct. Much of the uniformity of instinct seemed to be due to the uniformity of circumstances. A fruitful source of error in such an inquiry as the present was the persistence of certain persons, influenced by groundless pre-conceptions, in taking too lofty a standard of mind and conscience for their comparison of the powers and attainments of animals and men. They forgot what man was when found outside the influences to which they gave the collective name of civilization. If they would remember what savages were—men with whom they could not deny relationship—there might be less disinclination to admit animals lower in organization, but superior in acquirement, into the family circle. There were great disadvantages, structural and other, under which the majority of the lower animals laboured as contrasted with man. Their brain was far smaller, their earthward posture and their lack of hands imposed limitations on thought, and hindered progress by prohibiting the use of tools; vocal organs of an unelastic character restrained expression, and the brevity of their life prevented individual acquisition, and increased the strength of the rule of instinct. In beings of very low organization they found evidences of the existence of considerable mental ability. Ascending in the scale of organization, they found animals with nearly all the lower powers of the human mind, and many of the higher. Further, new knowledge, originating in changed circumstances, appeared among many creatures, rapidly to become common property by inheritance. The important point to be observed was, that whether the knowledges of animals were instinctive or acquired, they were soon combined and used in very complex, intelligent, personal activities. It was the fashion of the time to regard parental affection as mechanical in origin, instinctive in manifestation, and wholly unmoral in nature. Therefore to adduce their sublime devotion to their offspring as a proof of the moral qualities of animals would be simply to introduce another point of

debate. More to the purpose perhaps was the fact that many animals showed great sympathy for each other, and were capable of magnanimity, unselfishness, and charity. These manifestations of kindly feeling were, it was true, usually restricted to the creature's own kind; but it was a limitation of universal occurrence in the history of the moral effort of primitive man. Winwood Reade said: "Some travellers describe savages as demons incarnate, while others describe them as angels of light. It is not difficult to reconcile these statements. The savage outside his clan is almost without virtue, and inside his clan is almost without vice." Their poor relations did but follow the example of their cousins, when they let their kindness follow kind. Domestic animals—dogs particularly—extended the range of their affections and sacrifices to other animals and to man. Mental life was always in communion with a larger order than the law of its own kind, and was ever reaching upward—alike in brute, in savage, and in man—to that which was more than self. If they admitted the correctness of Mr. Darwin's definition, "A moral being is one who is capable of comparing his past and future actions or motives, and of approving or disapproving of them," then Mr. Romane's dog (of whose conscientiousness the lecturer related a remarkable story) was a moral being; and if they rejected that definition as inadequate, then they must be very careful that the one they offered in its place did not exclude from the domain of moral law large numbers of the beings now called men. The lecturer concluded with the expression of a hope that "we who meet in the name of that Athena whose breath the Greeks believed to be the life of all living things, may find that even more than is the interest with which we watch the play of atoms in their mystic dance, is the interest with which we can contemplate the iris of life glowing with sevenfold colour and giving dignity, hope, and promise to the lowliest thing that lives."

THE HISTORY OF NONCONFORMITY IN PLYMOUTH.

BY R. N. WORTH, F.G.S.
HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

(Read November 2nd, 1876.)

The dawn of the Reformation sheds little light on the religious history of Plymouth. We can only infer, not trace, the course in this town of the religious conflict of the sixteenth century. There is no evidence whatever that Plymouth contained any sympathisers with Wickliffe; that Lollardry ever obtained a footing within its walls. But there is evidence inferential, if not direct, that the Reformation was welcomed in the Western town, and developed into its extremer phase of Puritanism. At first the spirit of the Vicar of Bray must have been widely prevalent. There is no record of disturbances arising in connection with the dissolution of the monasteries, or the declaration by Henry VIII. of his supreme headship of the Church. No sympathy was shown with the great Western rebellion of 1549 against the new owners of the Abbey Lands, and for the restoration of the old faith. On the contrary, Plymouth afforded an asylum to the refugees, and was assailed unavailingly, on their retreat from Exeter, by the Cornish insurgents, though they burnt the "steeple" with the town's evidence. Perhaps it was in set-off for this that one rebel was subsequently "burnt" at the town's expense. But all this did not prevent Plymouth from moving with the times when Mary came to the throne. If Protestantism was really much in favour here, its professors must have been very lucky or very circumspect. Plymouth furnished no martyr to the Marian fires; she has no place in the bloody record of Fox; and the only indication of religious persecution at this time of which I know is the deprivation of the vicar of St. Andrew, John Peryn, in the last year of Philip and Mary. And yet when Elizabeth came to the throne Plymouth readily acquiesced in the new policy; and since the corporation

subsequently had the grant of the advowson of St. Andrew, they must have been regarded as thoroughly loyal.

All this would seem rather to indicate the spirit of Gallio than that of Geneva. Still the Puritanic leaven must have been strongly at work, at least in the latter part of Elizabeth's reign. Indeed so strongly marked does the Puritanism of Plymouth become that, whatever outward conformity to Catholicism there may have been under Mary, I believe the principles of the Reformed religion had continued to be firmly held, and that it was only in seeming, and not in fact, that Plymouth went back to the old faith.

The early Puritan was not a Nonconformist. He was simply a religious reformer within the pale of the Church, who differed from it, not in doctrine, but concerning the retention of vestments and ceremonials, which seemed to him to savour of Popery. His morality was severe, his piety ardent, his principles narrow, and in obstinate fidelity to conviction he gave place to no man. Puritanism grew more rigid after the accession of Elizabeth. The men who fled beyond seas to escape the Marian persecutions had become largely imbued with the principles and practice of foreign Protestantism.

A numerous and earnest body rejected the liturgy of King Edward, and adopted the Presbyterian scheme. Hence early in the reign of Elizabeth the divergence between the two sections of the Reformers widened to the inclusion of the question of discipline. Both, as Neal* says, agreed that there ought to be "one religion, one uniform mode of worship, one form of discipline and of church government for the whole nation, with which all should comply outwardly, whatever their inward sentiments might be." They differed eventually, not only on the form of that religion, but upon its legal foundation—its relation to the State. It was not until after several years of hot conflict, bitter enmity, and of persecution on the side of power, that the Puritans distinctly severed themselves from the national church, and established separate Presbyterian worship. Nor was this decisive step taken until the Puritan ministers had been ejected and, so far as could be, silenced. And even then the struggle to influence the character of the national Church continued.

We have evidence of markedly Puritan feeling in this diocese.

* Neal's "History of the Puritans," the leading authority for many of the statements in the earlier part of this lecture.

Coverdale was the bishop during the reign of Edward VI. Dodds, the dean of Exeter, and Tremayne, proctor for the Exeter clergy, were among the leading advocates of Puritan views in the Convocation of 1562. It was but a few years after this that, according to Neal, the Puritans were shut out of the Church by sequestration, imprisonment, and the revocation of their preaching licenses; and that several of the leading ministers so silenced agreed that, under these circumstances, it was their duty to break off from the public churches, and provide places where they might worship God according to their own consciences. Hence there was erected the first Presbytery in England—that of Wandsworth; and Puritanism first became Nonconformist.

Plymouth does not seem to have given occasion to any disputes. I have shown that there was a strong Puritan feeling in Devon. That Cornwall shared therein is proved by a petition sent up to Parliament, in which it was stated that one hundred and forty clergymen in that county were unable to preach a sermon; that of one hundred and sixty churches the greater number were supplied by men guilty of the grossest sins; and in which Parliament was asked to dispossess these "dumb dogs and ravenous wolves," and appoint faithful ministers in their stead.

The absence of reference to Plymouth in the voluminous records of the ecclesiastical disputes of this time shows that the Plymouth folk were well of one mind. That mind being Puritan, Puritanism here did not become Nonconformist until a much later date. The evidence is clear. The corporation had the patronage of the living, and exercised large control over church matters. And of the Puritan character of the corporation (a self-elected body, be it remembered) there can be no doubt. Take the two leading members. Sir Francis Drake was the son of a Puritan clergyman, who fled from Devon into Kent, because he had been called to account under the Six Articles Act. Sir Francis himself was a strong Puritan, and a friend of Fox the martyrologist, whom we find him addressing as his "loving and faithful sonne in Christ Jesus." And that Sir John Hawkins, Drake's famous kinsman, was also of Puritanic sympathies we may gather from his great esteem for Emilius Paget, the silenced Puritan vicar of Kilkhampton. From these two we may judge the rest.

But we do not rest here. The Plymouth work of those days was to fight Spain; and Plymouth men lived for little else.

Spaniard and Papist were to them one. They hated all that savoured of Popery, save golden candlesticks and jewelled shrines. Everything conspired to foster the Puritanic spirit within the community. Other foreign influence was not wanting. Francesco Diaz, a Spanish captain, found lying in Plymouth harbour, in 1568, eleven French cruisers, which, with half a dozen English, carried the flag of the Prince of Condé, and scoured the Channel in search of Catholic ships. One of these vessels was commanded by William Hawkins, brother of Sir John, and himself a corporator.

Plymouth, thus distinctively Puritan, was, as compared with the rest of the kingdom, Nonconformist in fact if not in name. But actual Nonconformity was not long wanting. The earliest separatist Protestant body was the Anabaptist; or, as we now say, the Baptist. Save in the rite of adult baptism the Anabaptists differed widely. There were the bloodthirsty Anabaptists who seized Munster under John of Leyden, and carried out a reign of terror which reflected with lurid power the horrors of the Catholic persecution. There were the devout, sincere, liberal-minded Anabaptists, who seem to have got hold of the principles of religious liberty and toleration when all the rest of the Christian world was in more than heathen darkness thereon. There were the rationalistic Anabaptists, who brought all doctrines to the tribunal of their private judgment, and in the enjoyment of that freedom sought to live in peace with all men. The true Anabaptists persecuted nobody; they were persecuted of all. Henry and Edward, Mary and Elizabeth, each in turn sent them to the stake. There still exists at Moretonhampstead an ancient General Baptist congregation, which tradition carries back to the days of Mary, and associates with the sufferings of her reign. The early Baptists came from Holland; and it is highly probable that the frequent intercourse between this port and that country led to Baptist opinions being implanted here. Much about the same time the views of Browne, from whom the early Independents took the name of Brownists, must have been received. I am not sure that Browne ever visited Plymouth, but the seed was sown by some one; for when in 1620 the Pilgrim Fathers came hither on their way to America, they "were kindly entertained and courteously used by divers friends there dwelling." The Pilgrim Fathers were Independents; and the earliest recorded Nonconformist organization of Plymouth was such a mixed congregation of Independents and Baptists as was then common.

Indeed it was out of such mixed assemblies that the Baptist societies sprung.

But we must return to the local Puritanism. This developed remarkably during the reigns of Elizabeth and James. In 1609 an order was made that no beer should be carried through the streets on the Sabbath except for the supply of strange ships; and we have another Puritanic clue in the constitutions of the Hospital of Orphans' Aid, founded by Thomas and Nicholas Sherwill in 1617; and of the Hospital of the Poor's Portion, founded by John Gayer, Abraham Colmer, and Edmund Fowel, "in performance of the trust reposed in them by the Mayor and Commonalty," in 1630.

In the constitutions of the Orphans' Aid we read: "Our will and desire is chiefly that they may be trained up religiously to the knowledge and fear of God, and to that end that they be catechized duly every day in the principles of religion, or at least one of them by turn in the hearing of the rest, either in the evening after supper, or at some other time as their tutor shall see convenient. Further our will is that duly, morning and evening, and at their repasts, they be held to prayer and thanksgiving. We would have them observe that they be duly at church at sermons, and other times convenient, and behave themselves reverently there, and that they be examined touching what they learn there, and restrained from idle recreation, on the Sabbath-day especially. . . . . As we would have especial care taken that the Sabbath-day be duly observed generally in all religious exercises, so more particularly for the perpetual remembrance of God's mercy to this land and His whole Church, more especially manifested to this place in that great deliverance A.D. 1588, we desire that yearly on the Sabbath-day next before the 25th July, there be read by them the whole prophecy of Joel, which was preached on and particularly applied to that invasion and deliverance, in this church about that time, and in part accomplished in our sight; and further that there be sung at the same time either the 46th or the 124th psalm, or some other to the like purpose."

The orders of the Poor's Portion direct: "First and principally we ordain that care be had that honest and religious orders and exercises be used within the said house, and by all the inhabitants therein, and that they be instructed and exercised in religious duties on the Lord's-day at such times as the public assemblies for religion are not; that every morning and evening they have their

set times for prayer and thanksgiving, that continual watch be had over them for avoiding all profaneness, &c. whatsoever."

It was in the reign of Charles I. that Plymouth Puritanism received its first check. Plymouth was one of the towns in which the desire for a preaching ministry had led to the appointment of lecturers, which was an ingenious device to supply the want of Puritan sympathizers among the parochial clergy, whence the Puritanic leaven had been rigorously weeded out. The corporation appointed the lecturers as well as the incumbents, and in September, 1631, the king ordered that Thomas Forde, of Brixton, who had been expelled the University of Oxford for preaching against the stone altar set up by Dr. Fewens in Magdalen Hall Chapel, was not to be chosen in that capacity. The Mayor replied that the king should be cheerfully obeyed. Two years later more serious difficulties arose. There was then living here a certain Sir James Bagg, the contemptible tool of a contemptible master—the worthless Buckingham—in whose interest he sought to use his official position in connection with the Customs and the Admiralty to govern the town. The character of this man is sketched in one word by himself. Writing to Buckingham he subscribes himself, "Your slave!" He seems to have been the constant fomenter of evil. In 1632 Upham, then vicar of St. Andrew, died. The corporation, in exercise of their undoubted right, appointed Alexander Grosse, the Puritan vicar of Plympton St. Mary. Grosse's institution was refused by the Bishop, and the king illegally presented Dr. Aaron Wilson, a thorough-going Royalist and Episcopalian. A connection so commenced could not prosper. Who was the aggressor I cannot say, but Wilson dragged the corporation before the Star Chamber on the pretence that the erection of the Hospital of Poor's Portion was an interference with his territorial rights; and they not unnaturally sought to have a lecturer of their own views since they could not approve the vicar. Bagg came to Wilson's aid. He moved the king, who wrote to Bishop Hall that certain persons had been endeavouring to maintain a lecturer in Plymouth without the approbation of the incumbent; and that the Bishop was not to admit any such, but to settle Thomas Bedford, and not permit him to be disquieted by Grosse, whom I hence gather to have been doing lecturer's duty. But the corporation were pertinacious; and I have to suggest that the petition which was presented to the king in the following year, asking permission

to erect a new church, had far less to do with the want of church accommodation in the town (the population of which had been greatly reduced by pestilence) than with the want of Puritan preaching. Wilson could not be got rid of, the lecturer was of the same type; what more ready mode of solving the difficulty than the erection of another place of worship? At any rate the church was built, largely if not wholly out of the rates of the town; and since the Civil War not only delayed its progress, but prevented its consecration until the Restoration, and in the interval it was used for Presbyterian worship, there is a sense in which Charles Church may fairly be called our oldest Nonconformist meeting.

During the siege in the wars of the Commonwealth (1642–46) there were several religious assemblies in the town, and not only Presbyterians, but Baptists, Independents, and Fifth Monarchy men, were represented. Plymouth, moreover, was then the refuge of many of the ministers of the adjoining parishes, who could not exercise their functions in the presence of the Royalist soldiery; as it was likewise the prison of not a few Episcopal clergy, whose zeal for the Royal cause brought them into the arena of political conflict.

There is little to record concerning the progress of Nonconformity here during the Commonwealth, when Presbyterianism was the established faith. St. Andrew was occupied by the Rev. George Hughes, leader of the Devonshire Puritan clergy, a man of high character, unblemished reputation, sincere piety, and great ability. The liturgy had been abandoned before his time by Francis Porter, preacher of Charles. There were two Nonconforming congregations. The oldest, the Baptist, is now represented by the Baptist Churches of George Street and Mutley, of Devonport, and of many other places in the neighbourhood. A careful, detailed, and interesting history of this Church has been written by my friend Mr. H. M. Nicholson. It sprung from the mixed congregation of Baptists and Independents already mentioned, and its records date back to 1648. In that year Abraham Cheare,* a native of Plymouth, and a fuller, was baptized, and shortly afterwards received an invitation to the pastorate, which he accepted in

* Cheare I take to have been of an Exeter family. There was buried at St. Andrew, April 30th, 1588, "Mighele Cheere, of Exon;" and two years later a daughter of Joan Sheere was interred.

the following year. The society must have been large, as the invitation was signed by one hundred and fifty members. In 1651 a piece of land was bought in the Pig-market, now Bedford Street, and a meeting-house erected; which was rebuilt in 1751, abandoned in 1789 in favour of the chapel in How Street, and finally, having been converted into stores, removed in April, 1865.

The Independents of the old united congregation and those of the garrison during the siege do not seem to have left any successors, and the Baptists continued the only separatists in Plymouth until the middle of 1654. There then came hither about the sixth month John Audland and Thomas Arey, two of the early Quakers, and were "received of many who were waiting for the Lord's appearance." They held several meetings in public and in private; "and on the first day the s^{d} John Audland went to one of the steeple-houses in the Towne, and testyfied against the priest and there worship, and also sounded truth amongst them, for w^{ch} the s^{d} John Audland received from the people in the steeple-house pritty much Abuse; and the s^{d} Thomas Arey he went to the Baptist meeteing, and sounded truth amonge them, who stod in great opposition to his testimony." On the 16th of the third month of 1655 Thomas Salthouse and Miles Halhead visited Plymouth, and established the first meeting, their reward from the powers that were being thirteen months' imprisonment at Plymouth and Exeter. In the same year George Fox paid the first of his four visits to Devonshire, and his journal records how, "Having refreshed ourselves at our inn, we went to Robert Cary's house, where we had a very precious meeting. At this meeting was one Elizabeth Trelawny, daughter to a baronet. She, being very thick of hearing, came close up to me, and clapped her ear very nigh me while I spoke; and she was convinced. After the meeting came in some jangling Baptists; but the Lord's power came over them, and Elizabeth Trelawny gave testimony thereto. A fine meeting was settled there in the Lord's power, which hath continued ever since."

There is a tradition in the Plymouth Society that the first meeting-house of the Quakers here was a thatched building which stood at the head of Sussex Street. Near this was undoubtedly the original Quaker burial-ground, used as such before the erection of the original meeting-house on the site in Bilbury Street in 1674, and not given up until 1721. The present meeting-house replaced the old one in 1804.

Plymouth was governed in all strictness during the Presbyterian régime; and there still remain a few illustrative records. Thus, in 1659, John Wood was presented for walking on the Hoe during "sermon time," and George Cragg for suffering company in his house to drink burnt wine during "sermon time;" while in June the constables of Old Town Ward presented John Olde "for keeping men drinking yesterday, being Lord's-day." This last of course is in accordance with modern ideas.

If the ruling powers had contented themselves with no more than this, matters would not have been so bad; but Milton was right—

"New presbyter was but old priest writ large."

Of religious liberty these Presbyterians had but the faintest idea. They were as zealous State Churchmen as the Episcopalians, and in behalf of their views were quite as ready to persecute. They were as rigorously fond of their Directory as the Prelatists of their Prayer-book; and under their sway many an Episcopal clergyman was fined, imprisoned, ejected. A law was even introduced into Parliament to punish blasphemy with death. Walker says all that can fairly be said against them (and a great deal more) in his well-known "Sufferings of the Clergy." But we must remember that here, as subsequently, politics were involved with theology. Episcopalian and Royalist, Presbyterian and Roundhead, were synonymous. Moreover, according to the accepted theory of a State Church, the officers of that church must be subordinate to the State. If the State changed its religion, it changed its officers likewise. The manner of the change is more important here than the change itself; and in the method adopted during the Commonwealth I do not see so much specially objectionable. Whatever was done was done methodically by process of law; and such care was shown for the ejected that they were assigned a fifth of the revenues of their livings for their maintenance, and were thenceforward unharassed. We shall have occasion again to refer to this. Undoubtedly there were many cases of individual hardship; undoubtedly a good deal that Walker says is true. But he starts with the idea not only of the divine right of the king, but of the divine right of the clergy; and his references to Plymouth are singularly unfortunate.

No such political considerations excuse the action of the Presbyterians towards the Quakers. The Independents and Baptists

were able to take care of themselves. Cromwell, with a large-hearted liberality, even protected the arch-heretic Unitarian Biddle. But the Quakers had very few friends; and, as in the earlier days of the Reformation, the men whose religious position depended solely upon the exercise of the right of private judgment persecuted those who dared to follow their judgment to different conclusions. The Quakers were fair game, and safe. I admit that they were aggravating, and that they showed little consideration for others in their perpetual testifyings in steeple and meeting-houses.

The persecutions of the Quakers at Plymouth began with a drunken naval chaplain, who attended a meeting held by Halhead and Salthouse in the garden of John Harris, and got excessively angry at being told to combine works with faith. He complained to John Paige, the mayor, and Salthouse and Halhead were committed to the assizes as disturbers of the public peace, and for "diverse other high misdemeanours against a late proclamation prohibiting the disturbance of ministers and other Christians in their assemblies and meetings." They were the disturbed; they were prosecuted as the disturbers. Then Margaret Killam offended the dignity of his worship the mayor by speaking to him on religious matters; and to gaol she went. Next year Priscilla Cotton, Margaret Cole, and Katherine Martindale spoke to the priest and people in the Church, after the priest—George Hughes, I suppose—had finished his sermon; and to gaol went they: while Barbara Pattison was locked up for interrupting a funeral sermon. In 1658, John Evans, for speaking to the people in a steeple-house, was not only imprisoned, but whipped through the streets. And so matters went on, until by 1660, the year of the glorious restoration of Charles II., every prison in the county was crowded with the Friends. "Within two months of that year the High Gaol and Bridewell of Exeter received no less than seventy, including all the men inhabitants of Plymouth of that persuasion.*

The evil days of Nonconformity were now at hand. For a quarter of a century, with intermissions that made the recurrence of tyranny but more galling, Presbyterian and Baptist, Independent and Quaker, were subjected to a persecution more persistent than any which England had known. "Continually

* See the "History of the Friends in Devonshire." By Mr. R. Dymond, F.S.A.

mocked with hollow promises of relief, now favoured by a temporary indulgence, and then visited anew with redoubled persecution, their whole life hung in suspense on the capricious humour and on the result of the conflicting purposes of the court and the parliament. . . . Persecution and indulgence, indulgence and persecution, in ceaseless alternation, make up the entire history of the time. Yet a sense of religious duty withheld the Puritan ministers from laying aside their pastoral functions. The strength of a solemn vow still bound them to their flocks. So long as the penal laws were in force they preached to their people in private, and visited them by stealth; while their retreats were hunted out by informers of the most infamous character, their places of meeting broken in upon by a licentious soldiery, and learned and holy men, dragged to the bar of justice for simply preaching the gospel, were insulted by magistrates, brow-beaten by judges, and laid up in fetid and unwholesome gaols—at that time nurseries of pestilence, and destitute of every Christian comfort and decency—among highwaymen and murderers."*

I hold the religious persecutions under his most religious and gracious majesty Charles II.—that merrily despicable monarch—to be the worst this kingdom has known. Mary was a consistent, conscientious bigot, a devoted daughter of her Church, who believed it better a few should burn here than many hereafter. And after all, burning is so far merciful that it is quickly over.

But Charles was a faithless, heartless, conscienceless debauchee, whose persecutions had no higher motive than the revenge of a mean coward spirit, without the warrant of conviction, without the excuse of policy. James, like Mary, was consistent, and had a policy—the policy of the re-establishment of his faith. But if the men differed, their acts did not. Both played with their victims before they killed them; and under their Christian rule thousands of men and women, driven from house and home, forbidden all means of livelihood, whipped here and imprisoned there, pilloried, branded, and cropped, suffered tortures to which the fires of Smithfield would have been a crowning mercy.

And the second Charles among his other virtues counts that blackest sin of ingratitude. It was to the Presbyterians, quite as much as to Monk, that he owed his recal from exile. This was recognized in his declaration at Breda: "We do declare a

* Tayler's "Retrospect of the Religious Life of England," pp. 250, 251.

liberty to tender consciences, and that no man shall be disquieted, or called in question for differences of opinion, which do not disturb the peace of the kingdom." And in the following October another declaration conceded, for the sake of pacification, "that the ministers should be freed from the subscription required by the Canon, and the oath of canonical obedience; receive Ordination, Institution, and Induction, and exercise their function and enjoy the profits of their livings without being obliged to it; and that the use of the Ceremonies should be dispensed with where they were scrupled."* Within less than two years came the Act of Uniformity, and Bartholomew-day, 1662, saw two thousand of the ablest, most learned, and most pious ministers of the Church cast out therefrom, because their consciences would not allow them to declare their unfeigned assent and consent to everything contained in and prescribed by the Book of Common Prayer, which, by the way, as modified by Convocation, very few of the seven thousand whose consciences were less tender could have seen.

"Nor shall the eternal roll of praise reject
Those Unconforming; whom one rigorous day
Drives from their Cures, a voluntary prey
To poverty, and grief, and disrespect,
And some to want—as if by tempest wrecked
On a wild coast.

* * * * * * *

Men the dictate of whose inward sense
Outweighs the world! whom self-deceiving wit
Lures not from what they deem the cause of God."

Persecution began in Plymouth before the Black Bartholomew. One Captain William Pestell paid the West a visit in 1661, apparently in the character of spy. He wrote to Secretary Nicholas, on the 26th September, that the Fifth Monarchy Men were associated with the Presbyterians in encouraging the people to withstand the common prayer; that "several of the old sea-captains at Plymouth were determined that the common prayer should not come into Mr. Hughes's church," and that there was the same feeling at other places on the coast, where Anabaptists and Quakers abounded.

The Presbyterians could not be touched until the Act of Uniformity; the Quakers were in prison before Charles returned; only

* Calamy's "Abridgment," vol. i. p. 152.

the Baptists were available. So Abraham Cheare was sent to Exeter gaol for encouraging religious assemblies, and remained there three months, until released by "special grace."

Plymouth was singled out for special visitation. Its gallant stand for the Parliament made it a marked town. Its corporation continued thoroughly Puritan. Every way it was obnoxious to the ruling powers. So Plymouth had a call from the commissioners appointed to regulate corporations, who ejected the mayor, made a clean sweep of his brethren, and turned out Hughes from the vicarage of St. Andrew, a week before the fatal 24th of August. The mayor, William Allen, a Presbyterian, gave place to William Jennens, who justified his selection by proving an adept in persecution; and the old corporators to new aldermen and councillors of the same school. Four ministers were silenced in Plymouth. George Hughes, the vicar; Obadiah Hughes, his son, ejected from a studentship at Oxford; Thomas Martyn, lecturer at St. Andrew; Samuel Martyn, his son, an occasional preacher. Porter, minister of Charles Church, then unconsecrated, conformed. George Hughes and Thomas Martyn were sent to Drake's Island, under the charge of two files of musketeers. That rugged rock then held the dignity of state prison; and among its occupants were General Lambert (who died there), Colonel Lilburne, and Harrington, the author of "Oceana." Hughes was attacked with dropsy and scurvy, and after nine months was released on bond for £2,000 (given by his friends without his knowledge) not to come again within twenty miles of Plymouth. So he retired to Kingsbridge, where, in July, 1667, he died. Martyn was released under a similar bond for £1,000. He had been silenced some months before Bartholomew Day, on pretence of speaking certain words in private conventicles, which he altogether denied. At the same time Cheare was again seized, and lodged in the gaol at Exeter for three years. Obadiah Hughes is said to have been imprisoned, but if so it could not have been for long.

The Bartholomew storm beat most violently on the heads of the ministers; but there are entries in the accounts of our corporation which indicate that the congregations suffered likewise, though their turn had not yet fully come. Between August 14 and September 29, 1662, £3 10s. were paid for sending away prisoners to the common gaol. These were neither rogues nor malefactors; for they were carried in under a separate entry; and I do not think it

unimportant to note that in the following year a whipping-post was set up in the workhouse, and the cucking-stool repaired.

It may be said, indeed it has been said, that the ejections of 1662 were but a retaliation for those of the Commonwealth. I would not defend persecution in any shape. I cannot say that all fault was on one side; but this I must say, that, so far as Plymouth is concerned, these persecutions are almost without the miserable excuse of retaliation. Aaron Wilson, according to Walker, soon after the commencement of the civil war, was sent away prisoner in a ship to Portsmouth. I do not justify this; but bear in mind that Wilson had been illegally thrust upon the town, that he had made himself obnoxious personally, and that his ill-treatment was connected with the great civil conflict. On Wilson's death the king, again illegally, appointed Bedford, and him the corporation sent prisoner to London. Then Hughes was appointed, or, as Walker says, "by the factious part of the town of Plymouth thrust into the vicaridge"—a statement utterly false in its implication, as the corporation only acted in their right. Hughes had episcopal ordination, and, according to Calamy, was duly instituted. Not a whisper can be breathed against his piety, consistency, and ability; and the legality of his occupancy of the living can hardly be questioned. The illegality of his removal is clear. Doubts have been cast upon his institution. There is a story told in Calamy that one of the ruck of the time-servers, who looked on the restoration of the Stuarts as the prelude to a feast of fat things, obtained the gift of the vicarage, and came down to turn Hughes out. "Are you sure the place is vacant?" said he; and, showing his institution, "they went away with a flea in their ear." This is very likely to be true; since, in August, 1661, one Dr. Lionel Gatford was presented to the living because he had been chaplain at Pendennis, and this would account for his not having it. When I add to what I have said of Wilson and Bedford that one Hobbes was frightened to death (according to Walker) by being told he should be thrown into the grave if he came to the churchyard again with his mass-book, I have said all that can be said of the persecution of Episcopalians in Plymouth.

When the appointed ministers were removed their adherents were not left utterly to themselves. There lived then in Plymouth a certain Nicholas Sherwill, member of a wealthy merchant family, an M.A. of Magdalen, a Presbyterian, who had received episcopal

ordination. He, with the younger Hughes, had been imprisoned, and set free on promising not to return to Plymouth without leave of the governor, the Earl of Bath, or his deputy. His absence could not have been long; for he commences the first register-book of the Unitarian congregation in Treville Street, now preserved at Somerset House, with the entry of the marriage by him at Stonehouse, on the 17th September, 1662, not a month after Bartholomew-day, of Walter Trowt and Katharine Crampron; while on the 28th November he baptized Mary, the daughter of George and Mary Lapthorne. He had no cure, but was an occasional preacher, and he ministered tō the people who adhered to Hughes and Martyn when they were cast into prison. In the congregation thus formed the two societies in Treville and Batter Streets originated. It has been held that there were two congregations from the commencement; but as Hughes and Martyn both ministered in the same church, and as Sherwill was the only minister free to engage in ministerial work in Plymouth immediately on the ejection, it seems clear that the Nonconforming layfolk of Plymouth must for a considerable time have constituted one body, though meeting in different places, as best they could. But Sherwill ere long had assistance. Obadiah Hughes was ordained by Jasper Hicks, the ejected from Landrake, and five other ministers, and preached in the neighbourhood as he had opportunity. At length, being no longer safe, he removed to London in 1674, where he became minister of a large congregation. John Quicke, ejected from Brixton, also preached in Plymouth, and once spent eight weeks in the Marshalsea. Quicke continued preaching at Brixton after Bartholomew-day, until removed by force. When prosecuted for this he excused himself on the ground that there was no one else to supply the spiritual wants of his people; and though imprisoned, contrived to escape on appeal. He would not agree to give up preaching as a condition of liberation; and indeed made the best of his opportunities in gaol by preaching to the prisoners there. For this Bishop Ward prosecuted him, and, I am happy to say, unsuccessfully. Nathan Jacob too, the ejected minister of Ugborough, rode to Plymouth once a fortnight, and eventually became permanent pastor here.

But for several years Sherwill was clearly the sole regular minister of the Plymouth Presbyterians. George Hughes never saw Plymouth after his retirement to Kingsbridge. He was then

sixty years of age, and worn out by infirmities. Thomas Martyn took advantage of the Indulgence of 1672, and returning to Plymouth, became minister of a Nonconformist society. There are entries of baptisms by him in the Treville Street registers from June 12th, 1672, to February, 1675, and he did not die until 1677. I believe it was upon his return that the division of the followers of the Ejected into two societies took place; for to this date the existence of two separate bodies can clearly be traced. Sherwill continued in the ministry until his sudden death, May 15th, 1696. His last entry of baptism was on the 7th May preceding. As the interments took place in the churchyard of the parish, where Sherwill could not officiate, he did not register burials; but he entered the texts and occasions of funeral sermons preached by him from August 15th, 1662, until September 8th, 1695. In his later years he had an assistant named Byfield, of whom Fox says that he had "the best sense and parts"* of any Dissenter he had ever heard. Sherwill was succeeded by John Enty.

Such briefly is a history of the establishment of the two congregations which represent in Plymouth the Bartholomew of 1662. Let us retrace our steps awhile, and consider the conditions under which that establishment took place. We have seen how their immediate founders, with the Baptist Cheare, were visited with imprisonment. Less fortunate than Martyn and Hughes, Cheare remained in bonds until 1665. Between 1662 and 1665 the records of borough expenditure clearly indicate that persecution was onward. In 1662–3 money was paid, not only for sending several persons to the gaol, but to poor people to give in evidence against them; and in 1663–4 Richard Philp and Abraham Appleby are entered as having been paid for their expenses in going to the assizes to give evidence against "the blind preacher." Who was this blind preacher? Philp was an informer. He appears in the following year as having been paid, with John Wolfe, for giving evidence against Daniel Northerne, who from a subsequent entry we learn was pilloried. He must have been either a popular or a dangerous character, for it took five men to guard him in the pillory.

William Jennens, the church-and-king mayor of 1662–3, was

* John Fox, of Plymouth, whose MSS. are preserved at the Plymouth Public Library.

a very zealous persecutor: probably he would have dignified his conduct by a higher title. Among those who were proceeded against during his mayoralty by his order, presented by James Jackson and Lucas Cocke, churchwardens, were the following: Samuel Northcott, senior and junior, Thomas Durant and wife, Richard Maine and son, William Allen, his wife, son, and man-servant, Captain Burthogg, Daniel Parrett, John Glanvill, Anthony Windeatt and wife, Thomas Short, Thomas Spry, Nicholas Gloyn, John Merrin, Thomas Spencer, John Daubance, Anthony Field, Roger Towle, Jacob Sanders, Charity Mohun, Richard Hall, William Stitson, Walter Trowte, Catherine Trowte — Presbyterians; John Trenicke, Thomas Trenicke, Edward Cole, Richard Vincent, James Blackburn, Thomas Teate, Josias Pickes, Samuel Fletcher, Richard Blagdon, John Bennett — Baptists; Nicholas Cole, Anthony Todd, Arthur Cotton, Margaret Dier, Elizabeth Ditford, John Light, Francis Light, Richard Smith, Francis Rawle, George Crocker—Quakers. Some of these were prosecuted for not attending church, some for not observing the rites of the Church as to baptism and marriage.

Great as was the persistence of the persecutors, that of the persecuted was greater. Writing from Exeter Gaol, 17th of 7th month, 1662, Cheare says: "The poor lambs that I have left have been visited by the constables again and again at their meetings, summoned before the mayor, fined for not coming to church, yet have a little strength left to meet in the same place, expose their goods to be spoiled, &c., rather than consent to promote that which their soul is grieved at."

That October between forty and fifty were taken in one meeting, ostensibly on the ground that they refused to promise not to take up arms against the king.* There appear to have been rumours about this time that Plymouth was to be the rallying-point of a Republican insurrection.

The Conventicle Act came into operation in July, 1664; and 1665 was a year of special activity with the dominant party. Cheare by the efforts of his sister was released, and returned to Plymouth. He enjoyed his liberty a month. Then he was apprehended, lodged a month in the Guildhall prison—a wretched den —and finally conveyed to Drake's Island, where he lay until his death, after great suffering, on the 5th of first month, 1668.

* See State Papers.

Cheare had numerous companions in suffering on the island besides Lambert and Lilburn. To one of these, Edward Cock, who died in 1666, Cheare alludes by name; and also to a companion prisoner at Exeter, John Edwards, junior, who died there in his twenty-seventh year. Burnet says of the Baptists that they were generally men of virtue, and of a universal charity; but these were days in which virtue availed nothing, and charity was a scoff.

Sherwill was also imprisoned in 1665. On the 6th of October he was called on by some officers of the garrison to go to a tavern, as the governor was waiting for him. He went, was taken into custody by a guard of soldiers, imprisoned, and not released until the 4th of December.

In the March following, 1666, William Allen* records in his MS. diary that, without any law commanding it, most of the townsmen of Plymouth took the oath appointed for Nonconformist ministers; and several were compelled to enter into bonds to the amount of £1,000. "Yea," says Allen, "besides such kinde of impositions were not practised in any part of the two kingdoms as in Plymouth." If so things must have been bad indeed. And I find that in 1664–65 the pillory and stocks were repaired.

The passing of the Five Mile Act in 1665 marked the culminating point of this first period of persecution. For the next three years Nonconformity in Plymouth seems to have been winked at. Nonconformists could not assemble for public worship, nor take any part in public affairs; but it was something to be able to meet without danger of disturbance by constable or soldier, and being fined or imprisoned at justicial caprice. By the Five Mile Act ministers were not allowed to come or be except in travelling within five miles of any city, town, corporation, borough returning members to parliament, or of a place in which they had exercised the ministry, unless they took an oath of fidelity to the Constitution in Church and State, and swore that it was not lawful to take up arms against the king.

In 1670 persecution was renewed, and a new Conventicle Act passed. The first Conventicle Act of 1663 declared that wherever five persons, beyond those of the same household, should assemble in a religious congregation, each should be liable, for the first offence, to be fined £5, or imprisoned three months; for the second offence the penalty was doubled; and the third entailed transporta-

* The mayor who was ejected for his Nonconformity.

tion for seven years, or a fine of £100. The new Act reduced the fines for the first and second offences to 5s. and 10s.; but fined the preacher and the house-owner £20 for the first offence, and £40 for the second; and there was a clause declaring that all doubts were to be given against the conventicles.

William Jennens was again in his element. He fortified himself by advice from the recorder, Sir John Maynard, as to the effect of the Act, and set heartily to work. So he and the mayor, William Symons, were very busy, in August and September, going about with a body of soldiers hunting out and breaking up meetings, and committing the conventiclers to prison. Allen records the breaking up of one meeting at Robert Mening's, and of another at Mr. T——y's; which means I presume, Trelawny's. Then there was another meeting proceeded against at Thomas Yeabsley's. Several Quakers were sent to gaol, and special mention is made of one Abigail Libby.

In 1672 Charles issued his famous declaration of indulgence, which allowed the license of Nonconformist preachers and meeting-houses. Under it there were licensed in Plymouth not only Sherwill and Martyn, but the younger Hughes, John Quicke, and George Mortimer, who had been ejected from Harberton, and apparently returned thither to minister. John Glanville, who had been proceeded against for not coming to church, had his house licensed for worship, as did Thomas Yeabsley. A house near Charles Church was also licensed, and the widow Menir's at Stonehouse.

This illegal indulgence was speedily revoked, and persecution again broke out; but I am unable for the next ten years to trace the course of events. During this period there were times when the Nonconformists practically enjoyed considerable liberty. There were also special local influences at work in their favour. The tone and temper of the corporate body changed gradually as the commission-intruded corporators died off, and new men were chosen to take their places. Moreover, powerful friends were not wanting. Chief of these was Brett, a wealthy merchant, who had served his apprenticeship with Samuel Northcote, the mayor removed and imprisoned in 1659, for scrupling to publish a proclamation of parliament in church. Brett was a great supporter of Nonconformist ministers; and not only maintained whole families of Nonconformists in their need, but furnished them with means to

leave the town. His son afterwards entered the ministry. Brett was a man of singular equanimity. Nearly all his property was lost in the capture of one ship—the Industry. He remarked to his daughter that there would be a little less for her, and said no more.*

During this period Charles and his brother, the Duke of York, paid the town a couple of visits, when the corporation displayed an exuberant and costly loyalty. To be stirred to loyalty in these days was also to be moved to persecution; but Charles, whatever he may have thought of the Nonconformist men, had no ill-feeling towards the Nonconformist women, if they were young and good-looking. Allen's son† records, with a certain amount of satisfaction, that his wife was kissed both by Charles and his brother on the Hoe. I suspect she was not alone in this.

Whatever the extent of the lull may have been, there was a very decided revival of oppression in the concluding years of the reign of Charles. The church-and-king party had again got the upper hand in the corporation, and used their power unsparingly. The character of the men is shown by the fact that they took the pains to send to Launceston to invite that "famously loyal" ‡ infamous brute Jefferies to pay the town a visit. This did not prevent his subsequently demanding the surrender of the town charter.

In 1682–83 the persecutions were thus again in full swing. Nathaniel Jacob and Samuel Martyn were conveyed to the high gaol by Peter Millet, Samuel Grere, John Bosaverne, Francis Spurrell, and other constables; while Richard Stephens and John Pane were equally energetic in carrying Quakers thither. In the following year, 1683–4, there is an entry of payments to one Richard Hall and his son Henry for their expenses in going to the assizes to give evidence against Nonconformist ministers. Jacob and Martyn and Sherwill were, so far as I know, the only ones in the town, and Sherwill appears to have escaped. The Baptists were without a pastor from the time Cheare was taken from them until 1687, when James to favour the Papists indulged the Protestants. Yet through nineteen years of persecution sixty-six members had kept the faith. Thomas Voisey, ejected from

* John Fox's MSS.

† Samuel Allen, who has also left a fragmentary diary.

‡ Yonge's "Plymouth Memoirs."

Thatcham, who used to preach in Plymouth, had died of fever, brought on by his excessive labour, in 1668. Jacob and Martyn were imprisoned about six months.

In 1684 the loyal justices of Exeter made an order offering 40s. a head for the apprehension of Nonconformist ministers, and Bishop Lamplugh commanded it to be read by his clergy in their churches;* but I cannot find that it affected Plymouth, although under the new freeman's oath appointed in that year every freeman was sworn to give the mayor notice of all conventicles.

How strongly, notwithstanding such sore afflictions, the fires of civil and religious liberty still smouldered in their embers, was happily manifested when James was hurled from the throne, and persecuted—still Puritan—Plymouth was the first town to declare for his successor. The Toleration Act was passed in 1689. This, though imperfectly, secured freedom of worship to all Dissenters who took the oath to the government, and gave security to their preachers who subscribed the doctrinal articles of the Church of England. It comprised the Quakers, but "excluded Roman Catholics and those who impugned the Trinity from its benefits; and it left the Test and Corporation Acts, passed in Charles II.'s reign, which made participation in the Lord's Supper, according to the rites of the Church of England, a legal qualification for civil office, in full force against Nonconformists."†

With the accession of Dutch William much of the better feeling and spirit returned; much of the animosity died out. When, full of years, Nathaniel Jacob died in 1690, Canon Gilbert preached his funeral sermon in St. Andrew Church, and concluded his discourse with the weighty words, "I have said more of this worthy man than I dare say of myself, or deserve that any person should say of me."

Freedom once given, Nonconformity speedily took a prominent position in the town. Long after the ejection many of the Presbyterians cherished the hope that there might yet be settled terms of comprehension. Nor until hope had departed did they commence the erection of meeting-houses. For nearly thirty years their conventicles were held in private dwellings. Martyn the elder baptized at "Greene House, near Charles Church, in Greene Street;" and it is not unlikely that this was Sherwill's residence, as we know

* Neal, "Hist. Puritans," vol. iv. p. 495. † Tayler, p. 533.

that he lived in that immediate locality. A chapel was erected on the site of the present Unitarian Chapel about 1689 by the adherents of Nathaniel Jacob; for when in 1690 Nathaniel Harding succeeded Jacob the congregation was large, and must have had a special place of assembly, and a trust deed of 1708 states that the chapel had been used several years previously for divine worship. Harding came to Plymouth from Ireland—more by accident than design—just after Jacob's death, was chosen in his stead, and remained pastor until 1743.

Sherwill's congregation about the same time, or a little earlier, met at the "Old Marshalls." They occupied it certainly for ten years,* and probably until the erection, in 1705, of the chapel in Batter Street. The "Old Marshalls" still exists—in the oldest portion of the distillery premises in Southside Street. Tradition connects this ancient building with the Dominicans. It may have been part of the fifteenth century guildhall; but whatever its origin, it was used in the seventeenth century as the Marshalsea or town prison. Probably the extensive additions to the Jacobean Guildhall in 1667 rendered a separate prison unnecessary.

Fox says of the dissenting ministers of his day, that "they were generally enthusiasts, and retained greatly that canting way of speaking and that old method of composition which was peculiar to the old preachers." He was still less complimentary to the congregations; for he speaks of the "seats and the beasts that sat in them," and of "the people of the country meetings as of mean rank and meaner understandings." Still under Harding (who was universally respected, and whom Fox terms a man of singular piety) and Enty the two societies flourished; and in 1715 mustered 1260 hearers. Both were on friendly terms, and the interchange of pulpits common. Doctrinally both congregations were Calvinistic, and known as Presbyterian. And though there was no actual presbytery or synod in the county, there was an analogous organization in the Exeter Assembly. On the 18th October, 1655, an association of Presbyterian ministers of the county was formed at Exeter to deal with matters of doctrine and discipline. This association held two meetings a year; and the county was divided into seven divisions, the ministers in which used to meet monthly. George Hughes was the first moderator; and the articles of asso-

* There are entries of baptisms at the "Old Marshalls" from July 27th, 1687, to August 20th, 1697.

ciation were signed by one hundred and thirty-one ministers. In the following year Independent ministers were admitted, and an address voted to the Lord Protector. There is no record of the Assembly's history during the troublous times of Charles and James the Second; but after the Act of Toleration it became the governing body of the Presbyterians of the county, examining and admitting candidates for the ministry, ordaining them, and exercising generally presbyterial powers. These old Nonconformists were heedful to provide a learned ministry as well as a spiritual. The ejected were almost universally men of university breeding. The exclusion of Nonconformists from the universities caused them to establish academies, some of which obtained great and deserved repute. Secker and Butler were both educated in the academy of Mr. Jones, of Tewkesbury. The most famous in the West was that of Mr. Warren, at Taunton; but Mr. Hallet had a notable one at Exeter. Into the latter Hallet's son, who corresponded with Whiston, introduced Arian views about the year 1708. These were taken up by five or six of the students, and eventually spread into the ministry, giving rise to what was known as the Western Arian controversy, which raged fiercely among the Presbyterians and Congregationalists of the West. Matters came to a head in the Assembly in 1716. The orthodox party won the day; and Pierce of Exeter, the leader of the Arians, and several other ministers, were ejected from the assembly, and left to preach, as Fox says, "to the poor remains of a few broken congregations, which had good-nature and charity enough to stand by their ministers, whose reputation, interest, and usefulness were absolutely ruined by the rage, aspersions, and violence of the other party."

Fox, himself inclined to Arianism, credits the orthodox ministers of his day with believing that they were specially commissioned for the governance of the church; in fact, with holding the doctrine of apostolical succession. The two Plymouth congregations were little affected by the first Arian wave. But the expulsion of that heretical element by no means purged the Assembly. Arianism found such favour with the younger ministers that at length, in 1753, the Assembly refused to declare against the admission of candidates to the ministry who would not profess faith in the deity of the Son and of the Holy Spirit. And so in process of time the Assembly became—though there neither were

then, nor are now (for it still exists), any doctrinal conditions attached to membership—first Arian, and then Unitarian.

Arianism first made head in Plymouth under the ministry of the Rev. H. Moore, successor to Mr. Harding; and as it showed itself at the same time in the Batter Street congregation, where it was favoured by Mr. Hanmer, assistant to Mr. Baron, there was a double exodus; the orthodox of both congregations settling in Batter Street, the heterodox in Treville Street, which has since been distinctly Unitarian.

An exceedingly interesting feature of the religious life of the town has passed into oblivion. Few call to mind the fact that Plymouth was the seat of a colony of Huguenot refugees, who settled here when driven from their own country by the Revocation of the Edict of Nantes. The first party escaped across the Channel in an open boat from Rochelle, arriving on the 5th September, 1681. They numbered between forty and fifty, and were joined by so many others that they established two congregations, one at Plymouth and the other at Stonehouse. It is the one redeeming feature in the years of persecution which followed, that these poor creatures do not seem to have been molested. We know little more concerning them than is to be found in the registers of the two congregations, now at Somerset House; those of the Stonehouse congregation ranging from 1692 to 1791,* and those of the Plymouth congregation from 1733 to 1807, the earlier records having been lost. The register of 1733 commences with an entry of the election, on the 11th April in that year, as wardens, of Pierre Hory Laine, Jayre Valeau, Jean Parc, and Moyere Thomas, in succession to Jean Parc, Etienne Brigeau, Francois Thomas, and Etienne Cagna—twenty-four heads of families assenting. In the July following there is an entry of the distribution of the royal bounty of fifteen guineas to fifty-one poor members of the community, ranging from eighty-two years of age to an infant in arms. Allowing five to a family, and assuming that the recipients of the bounty did not take any set part in the management of the church affairs, the number of the little colony may be reckoned at between 150 and 200. For fully half a century these sufferers for conscience lived in Plymouth, among, but not of, our forefathers. When they were householders they were entered in the rate-books under the style of Monsieur or Madame. Thus in the poor rate

* It was not dissolved until 1810.

assessment for 1720, the earliest preserved, we find with the prefix of Monsieur the names of Perry, Peter Perry, Francis Thomas, F. Jourdan (reputedly the first introducer of the printing business here), James Borgeau, Peter Bone, James Ruffiat, Charles le Mar, Isaac Oust, Mignan, Ruffiat, Valleau, Boteet, Pratt, Lavigne, Sherren, Freno, Dammer, Chardevoine, Bourvit, and Ruleau. Then we have Mesdames Cateau, Burfeans, Langaller, and "Mons. Osorio's widow." Other names of French origin occurring without either prefix (which was probably applied only to the well-to-do) are Francis Colas, Peter Averilla, Isaac and Peter Lelander, Abraham Angoure, Gilbert de Lapp, Gerrard, Stephen Cagna, Ch. Peneau, Bignon, Barbe, and Gabon, the latter described as a French barber. There was likewise a Dr. Freno.

The registers supply us with several family names in addition to those already given, among them Du Bouchet, Du Clou, Dore, Dechereaux, Arnaud, Bordier, Cherri, Viall, Blondett, Guillard, Benoit, Bastard, Rous, Dubois, Lardieu, Travers, Duval, Vincent, Herring, Gille, Delacomb, Gruzelier, Bonnet, Maingy, Darton, Lamoureux, Mousnier, and Paillin.

While the original refugees lived, and the first generation of their descendants, the foreign character of the little band was distinctively kept up; but the registers show that with the second generation exterior influences of association and intermarriage began to work; and the third was far more English than French. The knowledge of the mother tongue wore gradually less and less among the younger members of the community, and the attendance on public worship, which was of course conducted in the French language, gradually dwindled until it was confined to a few aged persons only, on whose death the congregation became extinct. James Devoit was pastor from his arrival, in 1685, until his death, in 1723. In 1733, the date of the first register, Pierre du Bouchet was minister. He was succeeded in 1739 by Jacob Bordier; who was followed in 1764 by Jaques Touzeau. It was during his pastorate that the congregation gave up the chapel which they had erected in How's Lane, and which was removed about 1785 to give place to the present edifice. Touzeau was the last minister. He died in February, 1810, having been pastor nearly half a century, and having outlived nearly all his people. For many years he kept a French school in Lower Lane, and he was much respected in the town.

Many of the descendants of the refugees still reside in this locality. Such names as Darton, Gruzelier, and Lamoureux, are of course easily identified; but in most cases there has been some amount of Anglicising. Thus Cherri is Cherry; Touzeau, Tozer; Gille, Gill; Parc, Park; Bonnet, Bonny; Lardieu, Lardew; Rous, Rowse; Viall, Vile; Lavigne, Lavin; Conde, Cundy; Benoit, Benoy; Guillard, Jillard; Jourdan, Jordan.

Towards the middle of the last century Conformity and Nonconformity alike fell dull and lethargic; decorous indeed, but wanting in energy and spirit — the form of Christianity truly, but lacking the vitality. The religion of feeling had no place where all was formal and frigid. Church and chapel come under the same condemnation. Nor was Plymouth any exception to this rule, though St. Andrew boasted the polished Zachary Mudge, whose sermons Dr. Johnson praised so highly, and the Treville and Batter Street congregations were enlivened somewhat by the stirrings of the Arian controversy. As to the Baptists, they were "a poor disjointed people," a "small remnant," the membership falling off until it was reduced to eight.* At Plymouth therefore, and in the growing town of Dock, there was ample scope for the exertions of the early Methodists, and both Whitfield and Wesley reaped an abundant harvest.

Calvinistic Methodism was the first established. Whitfield came to Plymouth about 1744 with the intention of embarking for America. But before that date his labours had borne local fruit. One Andrew Kinsman, a native of Tavistock, converted by reading one of Whitfield's sermons, settled in Plymouth as a grocer; and by him and his wife chiefly (she was a Mrs. Ann Tiley, and gave the ground) the Tabernacle in Briton Side was built, in the garden behind his house. Adams and Cennick and Midleton, with other of Whitfield's colleagues, and Kinsman himself, occupied the pulpit at first. In 1750 Kinsman became a regular minister, and in 1752 removed to Devonport, where he built the first dissenting chapel. The Tabernacle remained his property, and he was still accustomed to preach there, his chief assistants being named Dunn, Paddon, and McAll. Kinsman was a duly-qualified member of the church militant. When a party of seamen, led by their lieutenant, broke into the Tabernacle while he was preaching, with intent to put out the lights, and "castigate

* Nicholson, pp. 66, 67.

the congregation"—one of the humours, I presume, of a press-gang—Kinsman seized the leader, and took him before the magistrates. When Kinsman died he left the Tabernacle in trust for the purpose of perpetuating the gospel. The bequest was annulled by the Mortmain Act, and Kinsman's son became the owner. He was a very autocrat. The minister wished to get married. Kinsman preferred his celibacy. The minister got married. Kinsman padlocked the door of the Tabernacle, planted himself in a window opposite, armed with loaded pistols, and threatened to shoot any one who meddled with his property. So the congregation were ejected as well as their minister. For a while they met in the Baptist Chapel, which was placed at their service. At length Norley Chapel was built (then called the New Tabernacle), and opened December 8th, 1797. What became of the then Old Tabernacle for a few years I cannot say. There was a Mr. Cooper there in 1808, who formed his congregation into a Baptist church, and who was ejected by Kinsman in 1811. His congregation then divided, part going to the Moravian Chapel at the Old Mitre, and part to a currier's shop in Duck's Lane (Week Street), whence they moved, in 1812, to a chapel in Willow Street, built by the Universalists, first called the Philadelphian Church, but then the Refuge Chapel.

The New Tabernacle, so far as I am aware, was the first dissenting place of worship in the town in which an organ was placed. The instrument was built by a carpenter of Turnchapel named Redstone, chiefly at the expense of Mr. Cater. Terrible was the discord which resulted. There was nothing that the old Baptists quarrelled about more fiercely than the propriety of singing hymns in public worship; and the organ has continued down to our own day to be the abomination of sundry Presbyterians, especially of the Free Kirkers. The organ in the New Tabernacle led to a division in the congregation, and in the end to the re-opening of the Old Tabernacle. The Friday before the organ was to be opened a letter was received, signed "David," announcing that Dagon had fallen before the ark, and that the writer had discovered the art of taking his guts out. On examination it was found that all the pipes of one stop had been taken away, proving, as Harris, who records this incident, quaintly says, "that the thief was no musician."

Wesleyan Methodism was established in a settled shape in Ply-

mouth in the year 1745, when a class was formed. This was twelve months before Wesley—himself, be it remembered, of Nonconformist descent—paid his first visit to the town in September, 1746; and as a result he found several zealous local preachers hard at work, and great activity and zeal. More than thirty years elapsed before any attempt was made to erect a chapel. The members met in private houses, and there was a good deal of open-air preaching on the Parade, by the great tree in Briton Side, in rooms in Catte Street, Batter Street, in the Moravian Chapel, and the Old Tabernacle. The first Wesleyan Chapel in the Three Towns was commenced in 1779 in Lower Street, chiefly by the exertions of Redstone, a carpenter in the navy, and Nehemiah Jane, a quarterman in the Dockyard. This sufficed until 1792, when the chapel in Buckwell Lane (then called Mud Lane) was begun in Mr. Prideaux's garden. Thenceforward the progress of Wesleyanism was exceedingly rapid, though the larger population and greater activity of Dock gave it such a preponderance that Devonport still names the district. Ebenezer Chapel was commenced in 1815; and consequent upon the cessation of the war and the depression thus caused, Wesley Chapel had to be closed until 1847. Salem Chapel, however, was built in the meantime, in 1828. In 1864 the erection of King Street Chapel was commenced; and now there is to be a new chapel erected in North Street, in substitution for Wesley and Salem.

The period of the great French war, one of the greatest activity in all business affairs in Plymouth and Dock, was marked also by the greatest activity in religious matters; thus described by a no means friendly contemporary hand: "Amidst the general dissipation and rage for worldly aggrandizement, a religious disposition was everywhere prevalent. Churches, chapels, and meetings were crowded with auditors; the latter not only on Sundays, but many evenings in the week. Besides public places of worship, parties of the pious assembled at each other's houses, and embryo preachers here first practised the rudiments of their future calling. These spiritual pastors were principally uneducated mechanics and artificers in the Dockyard and town. Never perhaps did moralist survey a more incongruous spectacle than this place afforded. The most open and undisguised profaneness and the most rigid sanctity seemed equally predominant. On one hand were heard the revels of debauchery and drunkenness; and on the other, the praises and

prayers of devotional congregations! The sanctuaries of religion were surrounded by the temples of profligacy." *

This sounds very bad, and would sound much worse, did we not reflect that an equally stern censor might write pretty much the same, apart from the multiplicity of irregular meetings—the true conventicles—about the Plymouth of the present day. The contrasts are well-nigh as strong. There were, however, unusual religious activities here seventy to ninety years ago, chiefly in the direction of Calvinism. Several personal causes were formed by different preachers, most of which perished with the failing popularity of those to whom they owed their origin, while the religious societies of their day still continue to exist and flourish.

The most remarkable feature connected with this period in the religious history of the town was, however, the revival of persecution. The old spirit had never died; but it had shown itself in petty ways. Thus when the great Exeter heresiarch, James Pierce, was buried at St. Leonards, and it was proposed to place on his tombstone a tribute to the "learned, reverend, and pious" James Pierce, the rector objected that Pierce was not learned, because not bred at a university; not reverend, because not episcopally ordained; not pious, because not orthodox; and so his last resting-place was inscribed simply, "Mr. James Pierce's Tomb." And in like manner, on the death at Newton Abbot of Isaac Gilling, his remains were altogether refused interment. An appeal to the owner of the peculiar, Sir William Courtenay, resulted only in the gratuitous advice to bury him in the marshes, and so in the end he was interred in his own meeting-house.

But the dead care little about these things; and the Plymouth persecution was of the living. Though the Birmingham Bible-and-Crown riots did not extend to Plymouth, the spirit which actuated them found its way hither in high places. The Unitarian Chapel opened at Devonport in 1791 was closed, because the Commissioner of the Dockyard intimated that dockyardsmen who attended there would be dismissed as disloyal subjects; and by perjury and malice the Rev. W. Winterbottom, junior minister of the Baptist congregation at Plymouth, was punished for seditious words he never uttered, and for treason of which he was not guilty. It was the custom in those days for Dissenting congregations to celebrate the anniversary of the landing of the Prince of Orange

* Britton and Brayley's "Devon," p. 185.

by special sermons; and on the 5th of November, 1792, Winterbotham preached such a sermon in How's Lane from Exodus xiii. 8, "Thou shalt shew thy son in that day, saying, This is done because of that which the Lord did unto me." This he followed on the 18th of the same month by a sermon from Romans xiii. 12, "The night is far spent, the day is at hand: let us therefore cast off the works of darkness, and let us put on the armour of light." For these sermons he was brought to trial in the following July. The evidence for the Crown was wholly insufficient to sustain any charge; indeed, so far as regarded the second sermon, it consisted entirely of the jumbled notes of one Edward Lyne, a clerk to the Collector of Excise, and of the random recollection of John Denby, a midshipman, that he agreed with Lyne. On the other hand, there was abundant testimony that the sermons, though political, were anything but seditious. Yet Winterbotham was found guilty. He was sentenced to four years' imprisonment, two for each sermon; a fine of £200, £100 for each; and to find £900 security for his good behaviour for five years; while the expenses of the trial were £337. But his friends at Plymouth stood by him, and after his release he returned to minister among them.

While undergoing his first year's imprisonment on the state side of Newgate, Winterbotham published the two sermons. Careful and candid perusal will show that while Winterbotham was an ardent reformer he was no sower of sedition. He defended the Revolution of 1688; denounced the Church-and-King riots at Birmingham; condemned religious persecution in every form and shape; argued that "all government originates with the people," that "the people have a right to cashier their governors for misconduct," that they "have a right to change the form of their government if they think it proper so to do;" insisted on the need of parliamentary, legislative, and financial reform; and expressed a fervent hope for the due progress of the revolution in France. But he added, If "we labour under evils, we need not throw ourselves into a state of anarchy and confusion to obtain redress; to this you should prove superior; we want neither revolution nor blood." He advised his hearers to "take no doctrine on trust." "Persecute no man for his religious opinions, however different from your own. Extend with pleasure to others the liberty you claim for yourselves, believing a man may fill up the relative ties of society with honour though the dogmas of his religious creed

be not what you approve." Indeed, in a note he goes so far as to say, "The conduct and not the creed will to me ever be the criterion of Christianity. . . . . I shall ever deem that government tyrannic that does not afford equal advantages to the Catholic and Protestant, the Churchman and Dissenter, the professor of Judaism and the follower of Mahomet." Again, "Instead therefore of teaching your offspring blindly that they are governed by King, Lords, and Commons, teach them that these are men; that themselves are to arrive at the stature of men; that the excellence of their government is not in having King, Lords, and Commons, but in King, Lords, and Commons governing according to laws which secure the rights of every individual of the realm, and who are only worthy of esteem while they respect and venerate those rights." The second sermon enforced the reciprocal duties of governor and governed; and denounced persecution: "The day is at hand when men will no longer be persecuted for their religious opinions, further than they are destructive of morality, ... each worshipping God according to the dictates of his conscience, none daring to make him afraid, finding that while conscience is left at liberty men can unite as citizens and Christians; yea, as friends." And so too, raising his voice on behalf of the "unhappy African," he declared, "The night of slavery and bondage is far spent, and the day of universal liberty is at hand." Such was the man, such were the sentiments, such the language; in those days deemed worthy of persecution. Yet there was a little religious charity even then. When Gibbs, Winterbotham's co-pastor, died, Dr. Hawker, the famous vicar of Charles, and Mr. Hitchens, of St. John Chapel, Devonport, were among his pall-bearers.

Mass was celebrated in the Citadel Chapel during part of the reign of James II. by Christopher Turner, his Majesty's Catholic chaplain. But this did not lead to the local revival of Roman Catholicism; quite the contrary. The first priest who is known to have statedly ministered in Plymouth itself since the Reformation was the Rev. Edward Williams, chaplain to Mr. Richard Chester, of Buckland-tout-Saints, who occasionally visited the town. This was a century since. The first missionary station with regular worship was, however, established by the Rev. Thomas Flynn, an Irish Franciscan, in a room over a stable behind the George Inn, Dock. The first chapel, that in St. Mary's Street, Stonehouse, was erected by the Rev. Jean Louis Guilbert, a French refugee,

and opened in 1807; and it was not until the Cathedral was erected (the foundation-stone was laid by the present bishop in 1856) that Plymouth again possessed a Roman Catholic public place of worship. A century and a quarter after Plymouth gave shelter to the persecuted Huguenots, it afforded a resting-place to a community of persecuted Catholics. A sisterhood of the order of Poor Clares, who had been compelled to flee from France, occupied the premises at Coxside now used by Messrs. James as offices, from 1813 to 1835. Recently part of the old Carmelite property of the White Friars has been acquired by the Roman Catholics, who re-established their worship on the site whence it had been driven at the dissolution of the monasteries. Plymouth was created a bishopric in 1851. Dr. Errington was the first bishop, and was succeeded by the present prelate, Dr. Vaughan, in 1850.

Concerning the other religious bodies represented in the town a few dates will suffice. A few families of Jews settled here about 1740, and in 1764 built their synagogue. The Universalists, who now meet in Henry Street, worshipped previously in chapels in Richmond, Park, and Ebrington Streets. They have had an existence here for nearly a century. The Plymouth meeting of the Brethren dates from 1831. They erected what is now the Temperance Hall in Raleigh Street, and the large chapel in Ebrington Street, and have divided into several sections. The Catholic Apostolic body established themselves here in 1836. The Bible Christians, who date from 1818, erected their chapel in Zion Street in 1847. The Wesleyan Association body, another off-shoot from the Wesleyans, for nearly twenty years occupied the Old Tabernacle. Now, united with other dissidents under the name of the United Methodist Free Church, they occupy the large chapel in Ebrington Street, already mentioned. The Primitive Methodists have a little chapel in the same street. The Presbyterian congregation originally formed at Devonport in 1857 removed to Eldad in 1862. The Moravians are no longer represented in the town. They were active workers in the last century. Their chapel at Devonport, built in 1771, is now the only one west of Bristol.

And here, without further detail, my retrospect must close. This century does not present many salient features in the history of our local Nonconformity. But it has seen the gradual removal of the pains and penalties attached to the exercise of private judgment, and obedience to the voice of conscience, in the sixteenth and

seventeenth centuries. Under William III. the imperfect Toleration Act was passed. Under Anne the burdens were made heavier by acts against occasional conformity, forbidding habitual dissenters to attend worship and take the sacrament occasionally in the Established Church, and preventing dissenting teachers from undertaking the education of youth. On the accession of the House of Hanover these were repealed. Fifty years, during which public opinion became increasingly indifferent and therefore tolerant, elapsed before a further step was made. In 1779 profession of a belief in the Scriptures, with the declaration of Christianity and Protestantism, became the legal condition of toleration, instead of the acceptance of the doctrinal articles of the Church; and in 1812 provision was made for the registration of places of worship. In 1813 Unitarians were first admitted to the legal benefit of toleration. In 1828 the Test and Corporation Acts were swept away. In 1829 the Catholics were emancipated. The establishment of the London University first restored to the Nonconformists the advantages of a university education. In our own time the Jews have been relieved from the final shred of their disabilities; and church-rates (abolished long before in Plymouth by common consent) have been swept away.

There is now greater religious liberty than the land ever knew before; and the result is neither the old-time predicted anarchy nor immorality, but greater activity of religious life. The present generation has done more work in church and chapel building, and in religious organization, than the five preceding centuries. The whole fabric of persecution has been proven utterly baseless; its reasons as poor as its practice was cruel; its fears as worthless as its hopes were vain. Faggot and scourge have done their best, and worst. Thumbscrew and rack have worn out in their evil service. Gaol and gibbet have been glutted. And what has been the harvest? In the past retaliation. In the present an evil memory. Nought has availed to quench the fire of free opinion.

> "The Beautiful and True
> Live through all ages, while the false dies out."

All the blood shed, all the pain wrought, but aided what they were meant to crush. And now the children of persecuted and persecutor live and work side by side, for the most part in the honest and honourable rivalry of good effort, though in the under-

currents of life words of scorn, sneers of hate, and gnashings of impotent rage, do now and then arouse old feelings that should sleep, and call upon us to remember how

> "Truth fails not, but her outward forms that bear
> The longest date do melt like frosty rime,
> That in the morning whitened hill and plain,
> And is no more;—drop like the tower sublime
> Of yesterday, which royally did wear
> His crown of weeds, but could not even sustain
> Some casual shout that broke the silent air,
> Or the unimaginable touch of time."

It is not then to arouse the old antipathies, but to teach the nobler lesson of charity and good will, that I have endeavoured to trace the part which Plymouth has played in the history of Nonconformity — a part in which I at least see no reason to be ashamed. Here, as elsewhere, Nonconformity has been tinged by error, blurred by inconsistency, not free in itself from the faults it condemned in others. It has exaggerated trifles, and overlooked points of greater moment. But these failings were those of its day, which charity, perfected in suffering, taught it little by little to cast aside; and they are atoned for by a manly courage, a firm trust, an earnest piety, which sustained it through all its troubles; and in varying shape—the form changing, but the spirit one—have preserved it until now.

I could say much more: this is neither the time nor the place. But still at least I may add: However much that old bitter leaven of religious antipathy, which leads men to hate each other for the love of God, and which it is so easy to develope into persecution, may linger with us—however much Conformist and Nonconformist among themselves, and toward each other, may lack of Christian charity,—the old animosities revive with fading influence and narrower power, the bells do ring out the

> "Ancient forms of party strife."

And here of late in Plymouth, what 1576 dared not, 1676 would not, 1776 could not—do, 1876 has done.* At the call of humanity the widest differences of doctrine, and discipline, and formulary

* The reference here is to a meeting held in the Plymouth Guildhall a short time previously to the delivery of the lecture, in which men of the most diverse religious views united with one voice to protest against the Turkish atrocities in Bulgaria.

have been forgotten, and men of all shades of belief, all forms of worship, have found a common bond of union in a work of Christian charity.

> "Oh, human heart, thou hast a song
> For all that to the earth belong,
> Whene'er the golden chain of love
> Hath linked thee to the heaven above."

APPENDIX.

LISTS OF MINISTERS.

Ministers of the Baptist Church.—Abraham Cheare, 1649–1668; persecution then kept the church without a pastor for nineteen years; Robert Browne, 1687–1688; — Warner, 1688; Robert Holdenby, 1688–1690; Samuel Buttall, 1690–1697 or 1698; Nathaniel Hodges, 1698–1701; — Bryant commenced 1707, not ordained until 1710; Wm. Bennick, 1718–1720; Caleb Jope, 1720–1722; Elkanah Widgery, 1723–1725; John Ridley, 1726–1730; Didcot Hoare, mentioned as pastor in 1737 and 1739; John Binnick, left in 1747; Philip Gibbs, 1748 (ordained 1749)-1800; Isaiah Birt, co-pastor with Mr. Gibbs, 1782–1789; William Winterbotham, at first co-pastor, and afterwards successor to Mr. Gibbs, 1790 (four years in prison, 1793–1797)–1804; — Ragsdale, 1808–1810; John Dyer, 1811–1814; G. Gibbs, 1816–1819; S. Nicholson, 1823–1856; G. Short, co-pastor, and afterwards successor to Mr. Nicholson, 1856–1858; T. C. Page, 1860–1869; John Aldis, 1869–1876; Robert Lewis, co-pastor, 1870–1876; J. Benwell Bird, pastor of Mutley Chapel, 1876.

Ministers of the Unitarian Congregation.—George Hughes and Thomas Martyn, ejected in 1662; Nicholas Sherwill, 1662–1672; Thomas Martyn, 1672–1677; Nathaniel Jacob, 1677–1690; Nathaniel Harding, 1690–1744; Henry Brett, assistant to Mr. Harding, 1707–1723; Joseph Cock, ditto, 1721–1731; Henry Moore, assistant to Mr. Harding till 1744, and afterwards his successor, 1731–1762; John Reynell, 1762–1784; John Hanmer, co-pastor with Mr. Reynell, 1762–1771; Thomas Watson, 1785–1788; Thomas Porter, 1789–1794; John Kentish, 1794–1795; John Jones, LL.D., 1795–1798; John Tingcombe, 1798–1806; John Jones, 1807–1812; Israel Worsley, 1813–1831; William James Odgers, 1832–53; John Hill, 1853–1854; Henry Knott, 1854–1865; J. K. Smith assisted Mr. Knott for about two months

previous to his death, and continued on into 1866, but was never appointed minister; T. W. Freckelton, 1866–1874; William Sharman, 1875.

Ministers of the Batter Street Congregation.—George Hughes and Thomas Martyn, ejected in 1662; Nicholas Sherwill, 1662–1696; — Byfield, assistant to Mr. Sherwill; John Enty, 1696–1720; Peter Baron, at first co-pastor with Enty, came to Plymouth in 1700, was ordained 1704, chosen minister 1720, died 1759; John Moore, assistant to Mr. Baron, and his successor, 1727–1760 (the trustees then chose John Hanmer, the congregation Christopher Mends—the latter was put in possession by a mandamus, and Hanmer became co-pastor at Treville Street); Christopher Mends, 1762–1799; Herbert Mends, co-pastor with his father, afterwards his successor, 1782–1819; J. Mitchell, 1819–1821; Richard Hartley, 1822, driven away some years after because seen in a London theatre; W. Morris; T. C. Hine, 1839–1846; Joseph Steer, 1846–1851; John Barfitt, 1851–1854; W. R. Noble, 1855–1860; E. Hipwood, 1860–1867; W. Whittley, 1867.

Ministers of Norley and Sherwell Chapels.—Norley Chapel was opened 1797.—Charles Soper, 1798–1805; Thomas Pinchback, 1807–1811; Francis Moore, 1812–1816; James Doney, 1816–1823; W. P. Davies, 1825–1831; G. Smith, 1833–1842; Eliezer Jones, 1844–1856; C. Wilson, 1858. During Mr. Wilson's ministry Sherwell Chapel has been erected. The foundation-stone was laid in September, 1862, and the opening services held in September, 1864. The schoolrooms were opened in March, 1868.

EXTRACTS FROM CORPORATION ACCOUNTS.

August 1662 to 29th Sept next following

"Item paid for sending away of severall pson^{ers} to the comon goale wthin the said time £3 10."

Sept 29th 1662 to Sept 29th 1663

"Item paid for sending away severall persons to the Goale the said yeare as appeareth by the noate of perticulars now pduced to this accompt £4 13."

"Item paid for sendinge severall persons to the Goale & to poore people to give in evidence against them £1 15."

1663–4

"Item paid Richard Philpe & Abraham Appleby for their charges in goeing to the Assizes to give evidence against the blind preacher £3 4 6."

1664–5

"Item paid Richard Philpe and John Wolfe charges as witnesses against Daniel Northerne £3 0 0."

Subsequently a payment of £3 4s. is recorded to five men who guarded Daniel Northern when he was set in the pillory.

In the records for 1664–5, in addition to minor disbursements, there is an entry of £30 paid to John Martyn, the Mayor, for his expenses in entertaining the Bishop and his retinue and others several days, when his Lordship came to consecrate Charles Church. Andrew Horsman and another were paid £1 11s. 4d. for their expenses in inviting the Bishop; and one Mr. Jackson had 8s. 6d. for the rent of his tent, and for putting it up and taking it down, which reads suspiciously like a record of a luncheon in the churchyard.

1670–71

In 1670–71 £18 5s. was paid to several ministers.

1665–6

In this year £5 8s. was paid for sending away persons to gaol.

1669–70

"Item paid the Sarjeants charges for carrying Quakers to Exon £1 10."

"More paid for carrying Abigail Libby to goale $11^s/6^d$ and for James Holbertons charges to give in evidence against her 25^s £1 16 6."

"Item paid Mr. William Jennens for fee and charges to S^r John Maynard for advice about the conventicle act £1 6 6."

"Item paid Samuel Carkeete for his charge and horse hire in rideing to Exeter to precute a meeting which was att Mr. Yeabsleys house £2 5 0."

1682–3

"Item paid unto Peter Millett & Samuel Grere John Bosaverne, Francis Spurrell & other constables toward their charges in carryeing Mr. Jacob and Martyn Nonconformist preachers to the high gaol £4 5."

"Item paid unto Richard Stephens & John Pane constables toward their charges in carrying severall Quakers to prison £4 9."

1683–4

"Item paid unto Richard Hall and Henry Hall his son for their expenses and for horse hire in goeing to the County Assizes to give evidence against Nonconformist ministers with other disbursements relating to the same £3 5 0."

THE OLD NONCONFORMIST REGISTERS.

SHERWILL commences his part of the register with the words, "Baptized by mee Nicholas Sherwill," and his first entry is, "Nov 28 1662, Mary daughter of Mr George and Mrs Mary Lapthorne who was borne Oct 31st." From 1662 to 1676 he baptized in all thirty, the highest number in any one year being four. After this latter date the baptisms are more numerous, and reach to as many as fifteen in 1690, averaging ten annually. The last entry is on the 7th of May, 1696, and he died suddenly on the 15th. There are three entries of marriage: "Marryed by mee Nicolas Sherwill 1662 Sept 17 Mr Walter Trowt and Mrs Katharine Crampron at Stonehouse. 1663 July 15 Matthew Greet and Ruth Hingston at Brixton. 1670 May 3 Mr Abraham Sherwill and Mrs Joanna Fortescue of Spridleston at Plymton Morris." Interments took place of course in the parish churchyard, and there are no entries of burials. There are, however, entries of "funerall sermons preached by mee Nicolas Sherwill." The first was on the 15th August, 1662, the week before Bartholomew-day, at Staverton or Harberton. The next was on February 12th, 1670, and thence they continue down to September 8th, 1695. It is very evident that Sherwill was a man of note in those days. In 1672 he preached a funeral sermon for Walter Trowte at Exeter; in 1677 (September 21st) that for his friend the Rev. Thomas Martyn; on the 29th May, 1692, for the Rev. Mr. Henry Flamank at Tavistock; and on June 11th of the same year for Samuel Martyn at Liskeard. The text for the two Martyns was Daniel xii. 3; that for Flamank Hebrews xiii. 7.

Thomas Martyn commences his register of baptisms in the same book as Sherwill, but in a preceding page, June 12th, 1672, with the baptism of "Benjamin ye son of William and Mary Woodmason;" and of twelve baptisms down to the 11th September of that year, most are stated to have taken place at "Greene House neare Charles Church in Greene Street." I have little doubt that this was Sherwill's private residence, as I have discovered that he lived in this exact locality. The entries in Martyn's handwriting cease in September, 1673, but are continued in another hand down to February 3rd, 1675. It has been generally supposed that Martyn died in 1673; but there is the evidence of his funeral sermon by Sherwill that he died in 1677. As the book in which Martyn and Sherwill made their entries is marked "Register booke 1672," it is quite probable that at that date Martyn copied in his previous baptisms from another record.

THE HEBREW COMMUNITY.

THE land on which the Synagogue in Catherine Street stands was originally the property of the Corporation, by whom it was leased. It was then a garden; and the original lease to the founders of the present Synagogue was in 1762, the lessees being J. J. Sherenbeck, gentleman, of Plymouth, and G. J. Emdon, shopkeeper, of Devonport, the two elders of the Hebrew community at that date. The Synagogue was then built; and subsequently the freehold was acquired. One of the most liberal benefactors of modern Plymouth was a Jew, and a native of Plymouth—Mr. Jacob Nathan. His bequests were—

£1,000, the interest to be given half-yearly to the following: Israel Myers, Joseph Abrahams, Ann Isaacs, Bella and Esther Levy, and Harriet Bellem, and on their demise to the Hebrew Soup Kitchen, Aldgate, London, and the Guardians of the poor Hebrews, London; £1,200, interest of, to the Hebrew Blind Asylum, London; £1,000, interest of, to the poor of Jerusalem; £3,000, interest of, for establishing a school to be called the Jacob Nathan School, for teaching Hebrew, expounding the Holy Scriptures, and elementary education; £600 for establishing the Jacob Nathan School; £1,000, interest of, for the maintenance of the Hebrew public worship—Plymouth congregation; £500 for a burial-ground for Hebrews, Plymouth. The interest of the following sums also to be applied to the purposes named: £400, to be divided on different holidays to the Jewish poor, Plymouth; £200, for clothing children attending the Jacob Nathan School; £100, for supplying coals to Jewish poor, Plymouth; £100, for Jewish Ladies' Benevolent Society, Plymouth; £150, Jews' Free School, Greek Street, Soho, London; £200, for the Jewish Hospital, Norwood; £200, for Jewish Free School, Westminster; £200, for Jewish Orphan Asylum, Tenterground, Goodman's Fields, London; £200, Jews' Infant School, London; £200, Jews' Free School, Bell Lane, Spitalfields; £200, Jewish Institution for Diffusion of Knowledge; £200, Jewish College, Finsbury Square; £200, Jewish West Metropolitan School, Red Lion Square; £200, Philanthropic Society, London; £200, Hand-in-Hand Asylum, London; £50, Hebrew Benevolent Society, Bristol; £60, Jews' School, Birmingham; £50, Ladies' Benevolent Society, Liverpool; £50, Hebrew School, Newcastle; £60, Jewish Mendicity Society, Portsmouth; £200, South Devon and East Cornwall Hospital, Plymouth; £200, Public Dispensary, Plymouth; £150, Female Orphan Asylum, Plymouth; £150, Blanket Society, Plymouth; £150, Eye Infirmary, Plymouth; £60, Lying-in Charity, Plymouth; £50, Branch National Life-Boat, Plymouth; £50, Humane Society, Plymouth; £50, Sailors' Home, Plymouth; £50, Female Penitentiary, Plymouth; £50, Blind Asylum, Plymouth; £70, Female Home, Plymouth; £50, Industrial School, Plymouth; £50, Ragged School, Plymouth; £150, Orphan Asylum, Stoke; £150, Public Hospital, Devonport; £50, Blind Institution, Devonport; £200, Metropolitan Hospital, Devonshire Square, London; £200, London Hospital, Middlesex; £60,

British Asylum, Clapham; £60, British Home for Incurables, Clapham; £50, Deaf and Dumb Asylum, London; £70, National Orphan Asylum, Ham; £50, Deaf and Dumb Asylum, Exeter; and, absolutely, £19 19s. to the Society for Preventing Cruelty to Animals, Plymouth; the like to the Plymouth Soup Kitchen; and £30 to the Plymouth Benevolent Society.

SHAKESPEARE'S RICHARD II. AND MARLOWE'S EDWARD II.

A PAPER READ BY MR. MONTAGUE BERE, Q.C.

(November 9th, 1876.)

HANNIBAL—MAN AND WARRIOR.

ABSTRACT OF PAPER BY REV. H. OVERY, B.A.

(Read November 16th, 1876.)

The paper treated of the youth and training of Hannibal; his military career; his passage of the Alps; the Ticinus, the Trebia, Thrasimene Lake, Cannæ, Zama; of Hannibal as reformer; his exile; his death.

THE UNIVERSE.

A PAPER READ BY MR. F. G. LANDON, M.A.

(November 23rd, 1876.)

GEOGRAPHY OF DEVONSHIRE AND CONSUMPTION.

ABSTRACT OF PAPER BY DR. WILLIAM H. PEARSE.

(Read November 30th, 1876.)

By Geography is meant all the physical conditions of the earth. The body is related to all these, and, in fact, corelates with all physical Existences.

What are known as the so-called different diseases, are natural deviations of growth and rate, the result of defective co-ordination of the composition, and physical or vito-physical relations, of the body. The deviation of healthy growth, or failure of formative force, known as Consumption, happens, in the main, in man's best years—from twenty-five to forty-five; but the consumptive curve rises gradually through all ages, up to its highest, between twenty-five and thirty-five; then it again falls. That direction of vital force or growth which ends in Consumption fails more in female than in male Being; *e.g.* in England and Wales the mean percentage for ten years is as 2·48 female to 2·46 male. But the law or rate of Consumption, though grandly uniform, yet shows much variation. This variation, and diminution in some instances due to known and controllable physical conditions, makes the great interest of the enquiry; *e.g.* the Registrar-General shows that whilst in England and Wales of 1,000,000 born, 114,417 will die of Consumption; yet that in the "healthy districts" of England and Wales, of 1,000,000 born, 108,481 only will die of Consumption. Or again, in the opposite direction, London life casts up the male death rate to 3·35, the female being 2·39 only. The subject is here treated as a part of Natural History in its widest sense; the study pursued on the same method as that followed in the cognate phenomena of Hereditariness, contained-variability, &c.

Taking the limited area of Devon, we can see what physical,

social, or other conditions, affect the prevailing Law or Form of Consumption in human beings.

The returns in all cases are for the ten years 1861–70, being for the same period as those of the Registrar-General in his thirty-fifth Annual Report on England and Wales.*

TABLE I.

CONSUMPTION IN THE REGISTRATION DISTRICTS OF DEVON, 1861–70.

District.	Men.	Women.	Mean.	Density Acres per Person.	Approximate rainfall: mean for 8 years. Inches.
Totnes	1.56	1.81	1.68	2.75	58
Okehampton	1.57	1.92	1.73	6.58	40
Bideford	1.66	1.90	1.78	6.71	42
Plympton	1.77	1.92	1.84	3.75	49
Crediton	1.77	1.93	1.85	4.73	—
Axminster	1.49	2.34	1.91	3.04	35
South Molton	1.76	2.16	1.96	6.0	38
Tavistock	2.08	1.99	2.03	5.09	57
Holsworthy	1.77	2.35	2.06	8.75	45
Honiton	1.83	2.35	2.09	3.63	32
Kingsbridge	1.97	2.21	2.09	3.72	38
Stoke Damerel	2.21	2.35	2.28	0.03	—
Tiverton	2.19	2.38	2.28	3.45	37
Barnstaple	2.28	2.40	2.34	4.0	44
St. Thomas	2.28	2.46	2.37	2.63	33
Newton Abbot	2.78	2.31	2.54	1.66	44
Torrington	2.21	3.08	2.64	4.98	41
Exeter	2.92	2.43	2.67	0.04	33
Plymouth	2.83	2.88	2.85	0.021	39
East Stonehouse	5.93	2.56	4.24	0.013	—
England and Wales	2.46	2.48	2.47		†
London	3.35	2.39	2.87		

† The rainfall is deduced from the records of Mr. Pengelly, F.R.S.

The returns of the Registrar-General are made for Devon in the above districts; they are thus capable of comparison with the returns of any part of, or all of, England and Wales for the same periods. In the succeeding Tables the districts have been subdivided into similar geological or geographical areas. To the Tables of the Registrar-General, must be taken, as the standard, all investigations of special districts. The Districts specially examined in this paper are those of Tavistock, Plympton, Newton, St. Thomas, Barnstaple, South Molton, and Axminster.

* For the parish returns of deaths I am indebted to the courtesy of Mr. Secretary Hammick, and the Superintendent Registrars of the districts.

TABLE II.

TAVISTOCK DISTRICT.

	Mean Pop. of Parish.	Total Deaths in 10 years.		Death Rate.		Acres to Person	Geology.	Death Rate.		Mean Death Rate. M. & F.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Meavy	271	1	1	0.72	0.75	12.1	Granite				
Sheepstor	103	0	2	0	4.0	34.9	,,				
Walkhampton	731	3	2	0.78	0.57	14.4	,,				
Sampford Spiney	506	3	1	1.25	0.37	3.4	,,				
Lydford	2583	17	7	0.95	0.86	20.9	,,				15.6
Peter Tavy	417	3	0	1.44	0	8.3	,,	0.96	0.71	0.86	
Granite (excluding Sheepstor)	..	..	..	..	..	..	,,	0.96	0.60	0.78	
Whitchurch	1219	12	10	1.98	1.63	4.9	Devonian				
Tavistock	8373	94	83	2.36	1.88	1.3	,,				
Buckland Mona.	1377	9	16	1.31	2.3	4.6	,,				
Milton Abbot	1035	6	11	1.13	2.15	6.4	Devon. & Car.				
Beer Ferris	2248	25	29	2.14	2.26	2.78	Devon. & Riv.				
Calstock	6838	53	43	1.61	1.24	0.89	Devon. & Riv.				
Sydenham	556	2	2	0.72	0.71	2.5	,,	1.89	1.75	1.82	3.33
Lydford N.	208	1	2	0.90	2.0	10.9	Carboniferous				
Thrushelton	466	2	9	0.80	4.1	7.9	,,				
Stowford	468	4	6	1.71	2.5	4.4	,,				
Lew Trenchard	356	4	3	2.19	1.72	7.9	,,				
Coryton	240	2	3	1.75	2.38	5.4	,,				
Lamerton	1425	13	25	1.76	3.62	5.	,,				
Bradstone	127	0	3	0.0	4.6	9.	,,				
Dunderton	151	1	3	1.27	4.10	7.6	,,				
Kelly	221	0	0			7.7	,,				
Brentor	124	0	0			9.	,,				
Lifton	1480	20	18	2.73	2.66	4.0	,,				
Marystow	405	2	3	0.93	1.04	7.	,,				
Mary Tavy	1118	6	3	1.08	0.55	3.7	,,	1.60	2.32	1.96	6.8

The deaths are from Mr. Luxton's returns.

The granite region of Dartmoor in the Tavistock Union (half of the entire moorland) has an area of 73,386 acres, and a mean population of 4,194. Its death-rate from Consumption is 0·86, being the same as that of the Devonian region west of Exmoor. The excess of Sheepstor (4·0 F.) is explained by one family. The mean female population of Sheepstor is 50. Mr. Willis, of Horrabridge, writes me, that the two females who died (4·0 p.c.) were two sisters; another sister is at present ill of Phthisis; a brother has had an allied illness; a brother and two sisters of the grandfather, on the mother's side, died of Phthisis. The family have resided in Sheepstor since 1863. Excluding this strong hereditary case, the death-rate of the granite region is 0·78, being, with the Exmoor region, the smallest yet known in Devon. It is a region of rain, mist, westerly winds, relatively pure air, excess of ozone, and of active atmospheric physical changes, of a general out-of-door life. Mean annual Rainfall: Sheepstor, 64·66 inches; Prince Town,

59·92; Rundle Stone, 74·35; Tavistock, 49·36; Endsleigh, 52·80. In varied climates the rainy season is that of health. The Devonian region is healthier than the Carboniferous (as in North Devon also). But why the large death-rate of women in Dunderton, 4·10; Bradstone, 4·6; Thrushelton, 4·1; Lamerton, 3·62? Is it that the young girls and women are unduly exposed in open sheds, sitting, without sufficient exercise, picking over the ore? Mr. Gilbert Northy, of Tavistock, writes me, attributing the Phthisis to "innutrition, and especially after other diseases. . . . . At the time of illness, the poor are badly fed, and the rooms badly ventilated." But bad food, and ill-ventilated huts, are as existent on the moorland, with its small death-rate. Mr. Northy remarks that a great many cases of Phthisis in the Whitchurch district seem to be hereditary. The death-rate of women in many parishes is in great excess, above the mean excess of women over men, in England and Wales. Does the more out-of-door life preserve the men? Do they get better food than do the women? Does the moderate stimulant add to the vital power? or does the tobacco? Have men a more varied life, and less depressions? Can any local causes (mines, &c.) be discovered, affecting the women?

TABLE III.

DEATHS FROM CONSUMPTION IN DARTMOOR PRISON, DURING THE TEN YEARS, 1866-75.

Supplied by Dr. Power.

Date.	Number of Prisoners.	Total Number of Deaths.	Deaths from Consumption.	Remarks.
1866	627	13	1	
1867	613	8	2	
1868	636	10	2	
1869	739	7	3	
1870	881	14	8	
1871	902	5	2	
1872	958	13	3	
1873	943	8	1	
1874	934	7	1	
1875	943	8	3	
Totals.	8,176	93	26	
Means.	817.6	9.3	2.6	

There are thus 2·6 deaths from Phthisis, to 9·3 deaths from all causes; but the prisoners are at those ages, when, according to the Registrar-General, Phthisis is most fatal. He gives the return, that between 20–25, "nearly half of all deaths are by Phthisis;" between 25–35, Phthisis "is the most fatal disease of this age;" between 35–45, "Phthisis still predominates." It would appear thus, that the relative number of deaths by Phthisis is reduced by the prison and moorland life.

TABLE IV.

PLYMPTON DISTRICT.

	Mean Pop. of Parish.	Total Deaths in 10 years.		Death Rate.		Acres to Person	Geology.	Death Rate, Mean.		Mean Death Rate. M. & F.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Harford	164	1	2	1.23	2.40	12.4	Granite				
Cornwood . . .	1083	10	10	1.82	1.87	9.8	,,				
Shaugh	592	0	4	0	1.49	14.7	,,	1.15	1.81	1.48	12.3
Ermington . . .	1897	8	0	0.81	0.0	2.6	Devonian and				
Plympton Erle . .	992	6	12	1.42	2.1	0.23	Border Granite				
Plympton St. Mary	3258	27	23	1.75	1.32	3.1	,,				
Bickleigh	393	2	2	1.0	1.04	6.	,,	1.39	1.07	1.23	2.98
Holberton . . .	959	9	4	1.86	0.86	4.9	Sea-board and				
Revelstoke . . .	484	3	6	1.28	2.39	3.1	Devonian				
Wembury . . .	546	3	0	1.10	0.0	5.7	,,				
Plymstock . . .	3109	21	19	1.37	1.20	0.8	,,	1.43	1.12	1.27	4.6
Newton Ferrers .	700	2	5	0.59	1.37	4.4	Riverine and				
Tamerton . . .	1154	7	11	1.12	1.94	4.1	Devonian				
St. Budeaux . . .	1449	7	8	0.94	1.13	1.8	,,				
Laira	95	1	0	1.2	0	1.4	,,				
Egg Buckland . .	1238	6	8	1.0	1.25	2.1	,,	1.0	1.35	1.17	2.7

The deaths are from Mr. Kelly's returns.

Shaugh, with a mean male population of 267, had no death during ten years. Ermington, with mean female population of 972, had no death in ten years. Consumption has a low death-rate in the whole district of Granite, Devonian, and Sea-board. Rainfall at Ridgway, 47·92; Hemerdon, 49·26; Ivybridge, 49.05.

TABLE V.

NEWTON ABBOT DISTRICT.

	Mean Pop. of Parish.	Deaths in 10 years.		Death Rate.		Acres to Person	Geology.	Death Rate.		Mean Death Rate. M. & F.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Lustleigh	320	4	0	2.5	0	9	Granite				
Moreton	1509	12	9	1.62	2.46	5	,,				
North Bovey	514	4	5	1.4	2.12	10	,,				
Manaton	409	3	6	1.38	3.14	15	,,				
Widdecombe	877	10	3	2.15	3.16	12	,,				
Buckland	110	1	0	1.7	0	13	,,	1.77	1.26	1.51	10
Hennock	945	2	9	0.40	1.97	3.6	Granite and Carboniferous				
Ilsington	1179	10	14	1.5	2.4	6	Carboniferous				
Ashburton	3007	44	34	3.1	2.2	2	Carboniferous, Devonian, Granite				
Chudleigh	2074	40	23	4.09	2.09	2.9	Carboniferous				
Trusham	220	2	5	1.85	4.82	3	,,				
Bickington	278	1	2	0.73	1.37	4	Carboniferous, Devonian	2.65	2.19	2 42	3 5
Bovey Tracey	2106	20	26	1.94	2.41	3.4	Carbon., Granite, Bovey				
Wolborough, Newton, & Workhouse	5254	93	113	3.83	3.99	0.23	Bovey, Sand. Devonian				
Highweek	1598	16	15	2.15	1.52	1.5	Bovey Beds, Devonian				
Teigngrace	159	2	2	2.56	2.50	8	Bovey Beds				
Kingsteignton	1632	15	18	1.86	2.17	2.45	Bovey, Carboniferous	2.87	3.07	2.97	3.11
Haccombe	24	0	0	0	0	15	Sandstone				
Ideford	325	2	2	1.18	1.28	4	Sand. & Carbon.				
Ipplepen	164	2	1	2.2	1.3	9	Sand. & Devon.				
Abbotskerswell	445	4	8	1.73	3.37	3	,,				
Combeinteignhead	443	1	7	0.45	3.12	5	Sandstone				
Coffinswell	193	0	0	0	0	5	,,				
Kingskerswell	931	8	9	1.81	1.83	1.6	Sand., Limestone				
Bishopsteignton	1056	5	11	1.01	2.24	4	Sand., Riverine	1.25	2.20	1.72	5.8
Broadhempston	626	5	11	1.66	3.06	3	Devonian				
Torbrian	211	1	1	0.86	1.05	9	,,				
Denbury	379	2	4	1.11	2.01	2.8	,,				
West Ogwell	41	0	0	0	0	16	,,				
East Ogwell	286	1	0	0.67	0	4	,,				
Ipplepen	827	6	16	1.50	3.73	3.6	,,	1.29	2.66	1.97	
Dawlish	4127	46	46	2.93	1.90	1.3	Sea., Sandstone				
Teignmouth	6386	67	59	2.51	1.58	3.6	Sea., Sand., River.				
St. Nicholas	1195	7	13	1.41	1.86	1.5	,,				
Stokeinteignhead	654	2	6	0.67	1.68	3.8	Sea., Sand.				
St. Mary Church	3928	25	37	1.43	1.69	1.5	,,				
Tormohun with Torquay	19038	337	278	4.28	2.48	0.076	Sea., Sand., Lime.				
Cockington	199	4	4	5.0	3.29	6	Sea., Sandstone	3.28	2.14	2.71	

The deaths are from Mr. Alsop's returns.

Newton district embraces Sea-board, Granite, Devonian, Carboniferous, Sandstone (New Red), and the Bovey deposit (clays, &c.). Including Torquay, Teignmouth, Dawlish, &c. allowance must be made for its numerous consumptive visitors. The Granite region has the least death-rate of the district, but its death-rate is higher

than that of Western Dartmoor; *e.g.* Widdecombe-in-the-Moor, has M. 2·15, F. 3·17, against M. 0·95, F. 0·86, in Lydford. Geologically grouped, and in the order of least Consumption, the district stands: Granite; Sandstone and Devonian; Devonian; mixed Granite; Devonian and Carboniferous; Sea-board and Sandstone (Torquay and neighbourhood); Bovey beds. Ashburton (M. 3·1), Chudleigh (M. 4·9), Newton (M. 3·83, F. 3·99, including Workhouse), Ipplepen (F. 3·73), Broadhempston (F. 3·06), Abbotskerswell (F. 3·73), are exceptionally high; equally as high as the greater consumptive resorts of Torquay (M. 4·28, F. 2·48), Dawlish (M. 2·93, F. 1·90), Teignmouth (M. 2·51, F. 1·58). These instances may lead local observers to see special local causes. Generally, a high death-rate affects the females of this district; *e.g.* Moreton, 2·46; Manaton, 3·14; Widdecombe, 3·16; Abbotskerswell, 3.73; Combeinteignhead, 3·12; Bishopsteignton, 3·06; Ipplepen, 3·73; Trusham, 4·82. The rainfall of Torquay is 37·69 inches; Teignmouth, 35·70; Bovey Tracey, 44·01; Widdecombe, 58·95; Ilsington, 40·80; Ashburton, 51·38.

TABLE VI.

ST. THOMAS' DISTRICT.

	Mean Pop. of Parish.	Deaths in 10 years.		Death Rate.		Acres to Person.	Geology.	Death Rate.		Mean Death Rate.	Acres to Person.
		M.	F.	M.	F.			M.	F.		
Bridford . . .	542	3	2	1.02	0.80	7.5	Carbon. and Granite				
Christow . . .	906	17	12	3.74	2.65	3.5	,,	2.67	1.99	2.34	
Colaton Raleigh .	821	4	11	1.0	2.61	4	Sandstone				
Bicton	173	0	2	0	2.22	7	,,				
Dolton	14	0	0	0	0	15	,,				
Woodbury . . .	1966	30	23	3.23	2.21	3.8	,,				
Farringdon . . .	319	2	5	1.21	3.24	6	,,				
Aylesbeare . . .	1085	7	12	1.41	2.01	2.7	,,				
Rockbeare . . .	512	2	4	0.80	1.52	4	,,				
Whimple	728	2	5	0.56	1.34	4	,,				
Clyst St. Lawrence	160	1	2	1.33	2.35	6	,,				
Clyst Hydon. . .	319	2	4	1.26	2.5	5	,,				
Broad Clyst . .	2303	7	25	0.60	2.17	3.9	,,				
Honiton Clyst . .	384	2	2	1.10	0.98	4	,,				
Sowton	390	2	2	1.04	0.01	2.7	,,				
St. Mary Clyst . .	175	1	4	1.33	4.0	3.3	,,				
St. George's Clyst .	303	2	1	1.55	0.57	3	,,				
Heavitree . . .	3490	42	32	2.84	1.58		,,				
St. Leonard . . .	1627	15	12	2.61	1.08		,,				
Huxham	127	0	0	0	0	5	,,				
Rewe	273	0	1	0	0.73	4	,,				
Netherexe . . .	79	0	0	0	0	6	,,				
Brampford Speke .	486	5	2	2.10	0.80	3	,,				
Upton Pyne . . .	442	1	1	0.44	0.45	4	,,				
Shillingford . . .	65	0	1	0	3.4	6	,,				
Kenn	1039	10	3	1.92	0.57	5	,,				
Mamhead. . . .	205	0	0	0	0	5	,,				
Ashcombe . . .	212	1	1	0.85	1.05	8	,,	1.69	1.62	1.65	
Poltimore. . . .	337	3	3	1.75	1.78	5	Sand. & Carb.				
Ide	648	6	1	1.86	0.30	2	,,				
Stoke Canon . .	448	1	2	0.45	0.86	3	Carbon. and Sandstone				
St. Thomas . . .	4844	65	70	2.84	2.73	0.7	,,				
Dunchideock . .	143	2	2	2.66	2.94	6	,,				
Holcombe Burnell	228	4	5	3.30	4.47	8	Carboniferous				
Tedbury St. Mary.	744	5	6	1.19	1.85	5	,,				
Dunsford. . . .	868	6	4	1.42	1.05	6	,,				
Doddiscombsleigh .	321	4	2	2.38	1.30	7	,,				
Ashton	301	1	7	0.67	4.57	5	,,	2.20	2.23	2.21	
Otterton	1121	10	16	1.95	2.63	3	Sea & Sandstone				
East Budleigh . .	2696	22	32	1.98	2.01	1.2	,,				
Littleham . . .	3778	27	48	1.66	2.23	0.9	,,				
Withycombe. . .	2508	15	31	1.43	2.11	1	River. and Sandstone				
Lympstone . . .	1066	9	10	1.87	1.70	1.3	,,				
Topsham	3312	15	30	1.00	1.59	5	,,				
Alphington . . .	1208	16	10	2.72	1.61	2	,,				
Exminster . . .	1851	83	97	9.59	9.83	3	,,				
Powderham . . .	236	1	0	0.88	0.0	8	,,				
Kenton	1909	5	0	0.57	0.0	3	,,	2.33	2.49	2.41	

The deaths are from Mr. Champion's returns.

The St. Thomas district has a long Sea-board from West of the Sid to West of the Exe, including the rivers Exe and Otter. It has about $\frac{3}{4}$ sandstone, $\frac{1}{4}$ carboniferous. Bridford and Christow

touch the granite. The order of least consumption, and geological areas is: Sandstone; Sandstone and Carboniferous; Carboniferous and Granite; Sandstone, Sea and River (cast up high by Exminster).

The death-rate of many parishes is high, especially for women; *e.g.* Colaton Raleigh, F. 2·61; Farringdon, F. 3·24; Clyst St. Lawrence, F. 2·35; St. Mary Clyst, F. 4·0; Dunchideock, F. 2·94; Holcombe Burnell, F. 4·47; Ashton, F. 4·57; Exminster, F. 9·83, M. 9·59. The death-rate of Exminster is due to the lunatic population of the County Asylum. (See Appendix.) The almost adjoining parish of Kenton, with a mean female population of 1,034, had no death in ten years, whilst five only, males, died in ten years in a mean population of 875. What local causes make the death-rate in Broadclyst 2·17 for women, when it is only 0·60 for men? Is it the more indoor-life? Is the frequent high death-rate in South Devon and eastern Dartmoor, as compared with West Dartmoor, to be explained by the increased hereditary tendency of the population generally, arising from the fact, that the south of the county has so long been a resort for consumptives?

The rainfall of Clist Hydon is 33·55; Hele, 33·77; Brampford Speke, 35·11; St. George's Clyst, 32·17; Budleigh Salterton, 33·30; Exeter, 33·82.

TABLE VII.

BARNSTAPLE DISTRICT.

	Mean Pop. of Parish.	Deaths in 10 years.		Mean of 10 years.		Acres to Person	Geology.	Death Rate.		Mean Death Rate.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Goodleigh . . .	277	4	2	3.03	1.37	4.2	Devonian				
Highbray	272	1	1	0.65	0.82	15					
Challacombe . .	282	1	0	0.72	0	18					
Brendon	211	0	0	0	0	24					
Paracombe . . .	373	0	0	0	0	11					
Kentisbury . . .	404	1	0	0.5	0	7					
Arlington . . .	229	1	0	0.86	0	11					
Loxhore	243	1	1	0.82	0.01	6.3					
Bratton Fleming .	632	0	0	0	0	9					
Stoke Rivers . .	225	0	0	0	0	10					
Sherwell	567	1	1	0.33	0.46	8					
East Down . . .	412	0	0	0	0	8					
Bittadon	60	1	0	3.8	0	10					
West Down . . .	523	6	4	2.22	1.58	7					
Marwood	1002	3	3	0.59	0.60	5					
Countesbury. . .	192	0	0	0	0	18	Sea. and Devonian				
Lynton	1106	1	0	0.19	0	6					
Martinhoe . . .	214	0	0	0	0	11					
Trentishoe . . .	114	0	0	0	0	13					
Coombmartin . .	1451	1	0	0.13	0	2.6					
Berry Narbor . .	773	3	1	0.78	0.26	6.4					
Ilfracombe . . .	4286	37	44	2.08	1.75	1.2					
Morthoe	349	2	2	1.20	1.09	13					
Georgeham . . .	794	0	6	0	1.47	5		0.90	0.82	0.86	
Exclu. Ilfracombe .	..	..	..	..	..	..		0.51	0.39	0.45	
Braunton	2141	11	14	1.07	1.26	5	Riverine				
Barnstaple . . .	8522	133	153	3.48	3.25	0.13	River. & Devon				
Ashford	154	1	2	0.73	1.64	2	,,				
Pilton	1948	20	24	2.24	2.27	0.9	,,				
Heanton Punchard	528	4	3	1.55	1.11	5.7	,,	2.78	2.69	2.74	
Swimbridge . . .	1477	6	5	0.82	0.69	4.8	Carbonife-rous & Devon				
Landkey	685	2	7	0.60	2.0	4.6	,,				
Newton Tracey .	122	3	1	5.30	1.5	2.7	Carboniferous				
Horwood	113	2	0	3.63	0	7	,,				
Tawstock	1228	10	20	1.77	3.28	5	Carbonife-rous & River				
Bishopstawton . .	1880	20	32	2.51	2.95	2	,,				
Atherington . . .	588	5	2	1.75	0.66	5.6	,,				
Fremington . . .	1284	7	21	1.18	3.08	5.3	,,				
Instow	630	11	6	4.17	1.63	3	,,				
Westleigh . . .	483	4	4	1.68	1.63	4	,,	1.76	2.17	1.96	

The deaths are from Mr. Barry's returns,

TABLE VIII.

SOUTHMOLTON DISTRICT.

	Mean Pop. of Parish.	Deaths in 10 years.		Mean Death Rate of 10 years.		Acres to Person	Geology.	Death Rate.		Mean Death Rate.
		M.	F.	M.	F.			M.	F.	
Exmoor	331	0	1	0	0.66	62	Devonian			
West Anstey . .	300	1	0	0.62	0	10	,,			
Molland	587	1	3	0.31	1.07	10	,,			
Twitchen	238	1	0	0.8	0	12	,,			
Northmolton . .	1772	13	11	1.41	1.28	8	,,			
Charles	350	2	3	1.04	1.77	6	,,			
East Buckland . .	182	1	1	0.84	1.58	7	,,			
West Buckland . .	326	0	2	0	1.48	5	,,			
East Anstey . . .	227	0	1	0	0.83	14	,,	0.82	1.09	0.95
Bishopsnympton .	1176	1	4	0.16	0.73	8	Carboniferous			
Mariansleigh . .	270	1	1	0.74	0.73	7	,,			
Roseash	556	0	1	0	0.37	9	,,			
Knowstone . . .	488	1	0	0.38	0	10	,,			
Creacombe . . .	62	0	0	0	0	16	,,			
Rackenford . . .	463	1	0	0.41	0	8	,,			
Witheridge . . .	1225	3	7	0.47	1.19	7	,,			
East Worlington .	266	3	1	2.18	0.76	8	,,			
West Worlington .	198	1	1	0.89	1.15	13	,,			
Cheldon	89	0	0	0	0	12	,,			
Chumleigh . . .	1632	12	19	1.51	2.25	4	,,			
Burrington . . .	896	12	13	2.66	2.91	5	,,			
Warkleigh . . .	301	1	1	0.70	0.62	8	,,			
Satterleigh . . .	72	0	1	0	2.77	6	,,			
Kingsnympton . .	669	6	3	1.74	0.93	8	,,			
Meshaw	234	0	1	0	0.90	4	,,			
Romansleigh . .	219	1	1	0.83	1.02	11	,,			
Georgenympton .	242	1	3	0.81	2.5	9	,,			
Southmolton . .	3604	31	43	1.7	2.04	1.7	,,			
Filleigh	340	3	0	1.89	0	5	,,			
Chittlehampton .	1629	18	13	2.13	1.65	5	,,	1.29	1.51	1.40

The deaths are from Mr. Riccard's returns.

Barnstaple district, like West Dartmoor, shows the splendid phenomena of great freedom from Consumption; excluding Ilfracombe, it has the least death-rate as yet known of Devon. The splendid region, west of Exmoor, and bordering the sea, on the Devonian formation, and open to the west and north-west Atlantic winds, is almost free from Consumption. The inhabitants live an out-of-door life. Lynton, mean population 1,106, had one male only die of consumption in ten years. Coombmartin, mean population 1451, had one male only die in ten years. During the same period no female died of consumption in either parish. The Northern and chief region of the Barnstaple district is Devonian; the Southern is Carboniferous. There is also a small Riverine region. The Devonian is healthier than the Carboniferous. Ilfracombe, judged as a somewhat resort for the Consumptive, has a low death-rate

—M. 2·08, F. 1·75. Similarly Table VIII., which takes in the Southmolton district, a region adjoining to, and like that of Barnstaple, having the Devonian and Carboniferous formations, shows the smaller death-rate on the Devonian—F. 0·82, M. 1·09; mean for ten years, M. and F. 0·95.

The following parishes on the North Devon Devonian, with the mean populations annexed, had no deaths from Consumption during the ten years 1861–70: Brendon, 211; Parracombe, 373; Bratton Fleming, 632; Stoke Rivers, 225; East Down, 412; Countesbury, 192; Martinhoe, 214; Trentishoe, 114. The following Devonian North Devon parishes, with the mean populations annexed, had each one death in the ten years 1861–70: Barnstaple district—Challacombe, 282; Kentisbury, 404; Arlington, 229; Bittadon, 60; Lynton, 1,106; Combmartin, 1,451. Southmolton district—Exmoor, 331; West Anstey, 300; Twitchen, 238; East Anstey, 227.

The higher death-rate of the Carboniferous regions of Barnstaple and Southmolton agrees with the high death-rate of Holsworthy district, which is wholly Carboniferous. Holsworthy district is well known as a clayey, damp, "cold" soil. The labourers are much employed in draining operations; but it is the women who die in excess of Phthisis. That Phthisis should be high in Holsworthy district is presumable from Dr. Buchanan's conclusions, "that a wetness of soil is a cause of Consumption to those living on it." But it is the women who die in excess (M. 1·77; F. 2·35). Either, then, the out-of-door life or other causes, say stimulants or varied occupation, preserve the men, or the huts kill the women. Dr. L. Ash, of Holsworthy, considers the bad condition of the cottagers' huts to be a potential cause of Consumption in the women.

In the Southmolton district all death-rates which stand two per cent. (eight in number) are in Carboniferous parishes; no Devonian parish is as high. Does this difference in the death-rate of Carboniferous and Devonian resolve itself into a question of relative moisture of soil? The rainfall in the Southmolton district, of Rose Ash is 40·55; Witheridge, 35·36; Meshaw, 41·82. In the Barnstaple district, Bratton Fleming is 53·22; Martinhoe, 60·82; Ilfracombe, 37·51; Barnstaple, 39·47; Horwood, 34·19. Like to Dartmoor, the heathy parts of North Devon have a high rainfall. Martinhoe and Bratton Fleming, with the highest recorded rainfall, had no deaths of Phthisis in ten years.

TABLE IX.

AXMINSTER DISTRICT.

	Mean Pop. of Parish.	Deaths in 10 years.		Mean Death Rate.		Acres to Person	Geology.	Death Rate.		Mean Death Rate.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Charmouth . . .	661	3	7	1.06	1.84	0.8	Lias, Greensand				
Lyme Regis . . .	2275	25	30	2.28	2.03	0.5	Greensand, Lias				
Uplyme	975	5	6	1.02	1.23	3	,,				
Axminster . . .	2889	29	54	2.09	3.58	2.4	Lias, Marl				
Thorncombe . . .	1237	6	13	0.99	2.05	3.8	,,				
Hawkchurch . .	686	9	14	2.52	4.25	6	Lias, Marl, Greensand	1.83	2.58	2.20	
Chardstock . . .	1484	13	9	1.64	1.29	3	Chalk, Greensand				
Membury	742	10	8	2.61	2.23	5	Chalk, Greensand, Lias				
Axmouth	682	1	7	0 28	2.07	6	Chalk, Greensand, Marl				
Roosdown . . .	14	0	0	0	0.	14	Chalk, Greensand, Lias				
Seaton	901	4	14	1·05	2.64	1.3	Chalk, Marl				
Beer	1149	3	14	0.60	2.14		Chalk				
Coombpyne . . .	120	2	2	3.17	3.56	6	Chalk, Greensand	1.34	2.01	1.67	
Kilmington . . .	543	4	8	1.53	2.83	3	Sandstone, Marl				
Stockland . . .	1001	13	6	2.32	1.10	5	,,				
Dulwood	487	3	5	1.23	2.04	3	,,				
Shute	628	5	10	1.46	2.97	4	,,				
Colyton	2462	13	28	1.12	2.15	2.9	,,				
Musbury	514	1	3	0.40	1.11	4	,,	1.56	2.01	1.78	

The deaths are from Mr. Forward's returns.

Axminster district, by the Registrar-General's Report, shows, for the years 1861–70, a low death-rate for men (1·49), higher for women (2·34). The Geology of the district is very mixed; Greensand series, Chalk, Lias, Marls, &c. Classed geologically, and in the order of least death-rate, the parishes on the Chalk, Greensand, &c. show a mean of 1·67; those on Sand and Marl, 1·78; those on Lias and Greensand, 2·20. But the high death-rate of women has its probable explanation in the close rooms of the "schools" of the lace-makers; workers will have warmth in their rooms, at the cost of health and life. The damage to health toward Phthisis is slow, and not much felt in early stages; but it is none the less certain, where an impure air is continuously breathed. Where young people, yet in the formative period of animal being, sit inactive many hours a day, and year after year, in rooms *without effective means for the continuous escape of the foul air*, Phthisis must develope. Warmth must be provided, but not by

means of the warm foul air. These remarks apply probably to the high death-rate of women who make gloves in their own cottages at Torrington (the death-rate of Torrington district is 3·08 for women); perhaps also to Honiton, with a death-rate for women of 2·35. The Rainfall of Seaton is 35·46; Sidmouth (Honiton district), 31·45.

TABLE X.

SUMMARY.

Geological Areas, &c.	District.	Death-rate.		Mean.
		M.	F.	
Granite. Dartmoor . . .	Tavistock	0.96	0.71	0.86
Granite. (Excepting Sheepstor) .	,,	0.96	0.60	0.78
Devonian and Seaboard of North Devon	Barnstaple	0.90	0.82	0.86
Devonian, excluding Ilfracombe .	,,	0.51	0.39	0.45
Devonian	Southmolton	0.82	1.09	0.95
Devonian	Plympton	1.0	1.35	1.17
Devonian and Border Granite . .	,,	1.39	1.07	1.23
Devonian and Seaboard . . .	,,	1.43	1.12	1.27
Carboniferous	Southmolton	1.29	1.51	1.40
Granite	Plympton	1.15	1.81	1.48
Granite	Newton	1.77	1.26	1.51
Sandstone	St. Thomas	1.69	1.62	1.65
Chalk and Greensand . . .	Axminster	1.34	2.01	1.67
Devonian and Sandstone . . .	Newton	1.25	2.20	1.72
Sandstone and Marl . . .	Axminster	1 56	2.01	1.78
Devonian and Riverine . . .	Tavistock	1.89	1.75	1.82
Carboniferous and Riverine . .	Barnstaple	1.76	2.17	1.96
Carboniferous	Tavistock	1.60	2.32	1.96
Devonian	Newton	1.29	2.66	1.97
Lias and Greensand . . .	Axminster	1.83	2.58	2.20
Carboniferous	St. Thomas	2.20	2.23	2.21
Carboniferous	,,	2.67	1.99	2.34
Riverine and Sandstone . . .	,,	2.33	2.49	2.41
Carboniferous	Newton	2.65	2.19	2.42
Seaboard and Sandstone . . .	,,	3.28	2.14	2.71
Riverine and Devonian . . .	Barnstaple	2.78	2.69	2.74
Bovey Beds	Newton	2.87	3.07	2.97

APPROXIMATIVE THEORY.—The fact of the least death-rate from Phthisis being on the high and exposed regions of Dartmoor and Exmoor involves the study of many factors; such as geological formation, elevation, drainage of soil, amount of rain, and the relation of rain and mist to ozone, and to electrical phenomena in general—phenomena which are more active and changeful in high and wet than in low regions—to pure air ("air at the Seaboard and in thinly-populated districts being highly pure"—Dr. Angus

Smith), and to its relative composition at different elevations, &c. Man's body in these regions, exists more fully in relation to those physical existences and forces, which are inseparable parts, indeed, of life and being.

Analogy.—We may know by observation and analogy the conditions, or laws so-called, of Phthisis, and thus be on the method of prevention, long before we may have learnt the rates, order, and periods of vital being, or of the parts, limbs, or segments of animal forms. In the history of knowledge, analogy is a method equally or more pregnant than experiment even.

Out-of-door Life.—In other countries lessened Phthisis goes along with greater out-of-door life; *e.g.* as, at any rate, one cause, in the races of Central Asia; in negroes in the great deltas of Guiana, those who are field labourers are free from Phthisis, whilst those who become clerks, schoolmasters, &c., die much of Phthisis. The mean annual death-rate for ten years, 1864–74, in the colony of Victoria, was 12·04 for 10,000 of the mean population, whilst for the city and suburbs of Melbourne itself, it was 21·23 per 10,000. In England and Wales it was 25.47 per 10,000. (Mr. H. H. Hayter's *Notes on Victoria.*) There is in these instances indication of a generalization, where it is seen that out-of-door life, in climates so different as those of Dartmoor, 50° N. lat., Guiana, 6° N. lat., the dry, hot regions of Victoria and the Cape Colony, 30° to 35° S. lat., in Central Asia, in latitude 30° to 40° N. lat., have lessened Phthisis. On the other hand, town life in England increases the death-rate. London life diverts the natural law of women dying in excess of men; it having a mean of 3·35 for men, against 2·39 for women. The one condition common to such varied climates and races, is freedom from Phthisis, with out-of-door life.

Some known conditions under which Phthisis appears.—Wet soil (Dr. Bowditch, Boston, U.S.); irritating substances in the air, in some trades; monotonous indoor life, in some sisterhoods of nuns; children going to bed cold; indoor life, &c. (The question of food is not entered into in this lecture.)

Some other known Preventives.—Ague regions; *e.g.* Wisbeach, in the Fens, has a mean death-rate from Phthisis of 1·48 only, to 2·47 in England and Wales.

Some facts of the Natural History of Phthisis.—It is a too early (relatively to other parts, limbs or segments,) failure of *nerve* or vital formative power, of those segments of the animal, of which the lungs

are part; the so-far ultimate cells are "early checked in their development, and early succumb to a process of shrivelling" (Virchow); the cells, plasma, blood, nerve segments, lack, in certain segments of the body, vital force. That such early failure of formative force shall occur in the lungs can be, in a large number of individuals, many years before that it happens, predicated, where certain other anatomical conditions and types of body exist, as to skin, nails, hair, upper incisor teeth, &c.; these profound relationships of Phthisis, in the Natural History of the body, are seen in Hereditariness. The law or "Form" of Hereditariness prevails in living being; but in the progress of this law minor latent contained deviations temporarily appear. Qualities which are hereditary, arise, evolve, in living beings, by and of certain physical relations, time being allowed: On earlier (fœtal) cell forms, which "overlap" in man; on latent qualities and tendencies in animals — dormant generally — but which may become apparent at certain ages, and under certain physical conditions — "contained variability." Again, hereditary qualities disappear by and of certain physical relations. Phthisis can be both produced and prevented. (Central Asia, negroes in Guiana, &c.)

Slow rates of the Evolution or Series of changing animal types, and structure.—Geological time must be allowed in the study of hereditary variability, variations of type of animals, and of the deviation of animal tissue and structure.

"*Form*" (F. Bacon) *of Phthisis.*—Phthisis is a natural deviation of growth. "Every diseased structure has a physiological prototype" (Virchow); probable, that results which are "common" (natural or normal) in some animals, are of the same series as so-called "specific" in man (Simon). Phthisis is a rapid fever in some regions; a varying slow deviation of growth, generally, in Britain; but such variations of type "overlap" in instances. Phthisis has relation of interchange with ague; follows, in a series, after fevers (measles, &c.); is inoculable; is producible by certain modes of life and external physical relation; is hereditary; is preventable by certain full natural physical relations and co-ordinations; more related to female, than to male lines of Being. We thus approach the "Form" of Phthisis, by so varied external relationships; and again by the *deeper* lines of the series of vital evolution, structure and being; by alliances existing between the "common" and so-called "specific" capacities and changes of

different genera of the animal kingdom; by alliances between very varied animal phenomena—*e.g.* ague and Phthisis, &c.; by gradations of type in the so-called "diseased" deviation; such gradations not only being seen in different latitudes, but in the "overlapping" phenomena of varying types in one and the same latitude.

Method.—The spirit and method of the philosophical geologist, or comparative philologist, must be extended to the study of the variations of the growth of animal texture and cells (*e.g.* Phthisis). It seems a "necessary truth" that living Being (plants, animals, &c.) is sustained, and yet also now evolving, of uniform and determinate series: deviations or failure of growth, have purely natural causes in defective physical composition of the body itself, and deficient physical co-ordination with Existences external to the body.

Co-ordination.—What a greater entirety of physical relations, as on Dartmoor, can effect of just co-ordination of the parts of the body, so analogy (*e.g.* Iodine in Goitre, arsenic in skin changes, &c.) leads us to expect that small amounts of certain mineral elements will co-ordinate the formative forces, and the longevity of the lung tissues to the longevity of the other tissues of the body. The vital force is a corelatable "mode" and "affection" of matter and force; vast "force" contained in small amounts of matter. In nature, Ague touches Phthisis; Arsenic touches Ague and the Skin System of animals; the Skin System has relation to Phthisis; hence expectation that Arsenic, or its chemical isomorphs, may co-ordinate against Phthisis; an analogy remote, but actual. Time must be allowed, and the vast involvements of nature remembered.

Pure Air.—Remembering Dr. Angus Smith's proofs of the purity of air at the sea, and in sparsely-populated districts, and remembering the slow but sure rates of increase of Phthisis, in atmospheres known to be impregnated, more or less, by organic and inorganic substances; remembering also the alliance of Phthisis to fevers (ague), the experiments of Tyndall on "germ clouds" have a possible bearing. But, after all, as certain types of individuals never will or can pass to Phthisis, so we aim to co-ordinate the vito-chemical composition of the body of those who we know do tend to Phthisis, and doing that, by perfecting the entirety of physical relations; and yet further seeking some mineral element which, if supplied, shall create the just co-ordination: a deeper generalization than that of "germs" as causes, is needed.

Of Sea Products, and some Minerals.—Cod Liver Oil is the most powerful, yet known co-ordinator of lung-growth. It is not the oil as a food only, which acts, but certain states of chemical relation, which, in part, are potential; hence the value of rancid oils; on "nascent" states of chemical relation; on the power of natural mineral waters on the system; on "fancies" for special foods and substances, as most potential, when supplied. Other sea products have been extensively tried by the Lecturer, as sea-weed (*Fucus vesiculoris*), manganese, arsenic, iodine, muriatic acid, sea-water itself, variously combined; but more trials are needed. Help may be expected from the spectrum analysis of the actual composition of sea-water.

Bacon says, in the *Novum Organum*, " . . . true axioms are first to be drawn out from all kinds of experience; and the experiments of light, not of profit, to be investigated. . . . . Axioms duly discovered and established, will afford plentiful harvest of practice, and draw after them whole sheaves of works."

APPENDIX.

By the courtesy of Dr. Saunders, Medical Superintendent of Devon County Asylum, the following Table of Phthisis in Exminster and the Asylum is appended.

PHTHISIS. DEVON COUNTY ASYLUM, 1861–70.

Year.	Average Lunatic Inmates.		Total Average Lunatic Inmates.	Deaths from Phthisis.		Total Deaths of Phthisis.
	M.	F.		M.	F.	
1861	248	346	594	3	8	11
1862	265	384	649	4	4	8
1863	268	393	661	14	11	25
1864	277	395	672	9	11	20
1865	288	401	689	6	10	16
1866	275	399	674	5	11	16
1867	258	400	658	6	6	12
1868	275	421	696	4	2	6
1869	271	421	692	4	7	11
1870	278	426	704	5	10	15

PHTHISIS. SUMMARY OF EXMINSTER, 1861–70.

	Total Parish.		Asylum.		Parish, excluding Asylum.	
	M.	F.	M.	F.	M.	F.
Total Mean Population .	865	986	270	398	595	588
Total Deaths of Phthisis	83	97	60	80	23	17
Percentage . . .	9.59	9.82	22.22	20.10	3.86	2.86
Mean Percentage . .	9.72		20.96		3.38	

The Table will be a fact toward the rate or law of Phthisis and the Insane. The tendency to Phthisis in the Insane has been pointed out by Dr. Saunders (Report of Devon County Asylum, 1873), and by other authors. Not only have the importance of hygienic measures, such as large cubical space in wards, been insisted on (Report D. C. A., 1863), but the profound nature or form of Phthisis, as involved with "nerve supply," has been recognized. (Report D. C. A., 1873.)

The relation of animal type in man, to Phthisis, is seen in the very different death-rate of Prisoners (see Table of Prisons) to that of those who become Insane.

The study becomes one of natural history in its widest sense, involving all physical relations, and the deeper "form" and laws, of the evolving and sustained series of vital Being and animals.

PERSONAL EXPERIENCES AMONG EMANCIPATED SLAVES.

ABSTRACT OF REV. W. SHARMAN'S PAPER.

(Read December 7th, 1876.)

After giving a succinct account of American negro slavery, and its abolition, the lecturer narrated his experiences of the condition and prospects of the emancipated slaves. He had found the negro docile, childish, dependent, indolent, thoughtless, untruthful, and addicted to petit larceny; but he believed him to be capable of a high civilization, and entertained hopeful views of his future.

THE PHYSIOLOGICAL BASIS OF MUSIC.

ABSTRACT OF DR. MEERES'S PAPER.

(Read December 14th, 1876.)

The lecturer contended that music was frequently but erroneously spoken of as a language. He considered that sound, like heat, light, and electricity, was a physical agent capable of modifying man's bodily and mental condition. He defined noises and musical tones; and argued that harmony was a modern development of music, explaining the distinction of concords and discords, the various kinds of beats, perfect and imperfect consonances, and the anatomical structure of the human organ of hearing with reference to sympathetic vibration.

THE BREATHING ORGANS OF FISHES.

ABSTRACT OF PAPER BY MR. J. KINTON BOND, B.A., F.L.S.

(Read December 21st, 1876.)

The lecturer gave the definition of a fish, and then classified fishes. He showed the essential process in animal respiration, and the modification of the process in the case of fishes. He demonstrated

the outline of the blood circulation in the class, and illustrated the arrangement and structure of the breathing organs in the peleostii or bony fishes, in the elasmobranchii or cartilaginous fishes, in the marsipobranchii, in the ganoidei, in the amphioxus, and in the lepidosiren.

COMETS.

ABSTRACT OF PAPER BY DR. MERRIFIELD, F.R.A.S., F.M.S.

(Read January 11th, 1877.)

The lecturer treated of the superstition among the ignorant, the forms of orbits of planets, contrasted those of planets and comets, and explained the elements of comets. He showed how they are recognized on their reappearance, sustained Lexell's comet; and gave a description of comets—nucleus, coma, and tail. Proof of small masses of comets from the effects of Encke's and Biorson's was noted; and concerning the material of which comets are formed, proofs from polariscope and spectroscope. Reference was made to the number of comets that come within the solar system; and their connection with star showers; reasons given for believing in an intra-Mercurial planet; and the effects of a collision indicated.

COLOUR IN NATURE,

AND ITS RELATIONS TO PRACTICAL PICTORIAL ART.

ABSTRACT OF MR. A. SHELLY'S PAPER.

(Read January 18th, 1877.)

It treated of light, colour, inherent colours, mixture of colours in nature, contrast of colour, technical processes of art in relation to mixture of colours, colour as influenced by daylight and atmospheric changes, light direct, reflected and transmitted shadow, warm and cool colours, clouds, foliage, water, and technical processes of art in relation to the foregoing.

ON THE HYDROGEOLOGY OF THE PLYMOUTH DISTRICT.

BY MR. JAMES C. INGLIS, A.I.C.E.

(Read January 25th, 1877.)

The term Hydrogeology, at a recent meeting of the Institution of Civil Engineers, Mr. J. Lucas defined as follows:

"It was first used by the author in 1874, and takes up the history of rain-water from the time that it soaks through the soil, and follows it through the various rocks which it afterwards percolates." Mr. Lucas further explains: "A Hydrogeological survey comprehends an examination of all facts bearing on the form and position of subterranean water systems, and in basins where they are covered by superincumbent strata, the extent to which they are syphonised, together with other particulars tending to show their general capabilities for supplying water."

Somewhat lately the interest in this subject, the circulation of rain-water, has revived, and at the present moment it commands a large and increasing number of students in France, Germany, Italy, and England. In this country sanitary questions have been, and still are, a source of great vexation of spirit and intellect to many a municipal officer; so much so, that our largest assembly, the Council of the Nation—Parliament—resounded with the watch-word, "*Sanitas sanitatum omnia sanitas*" not so very long ago. The agitation has had its good results, mostly in seriously drawing attention to the points at issue. This revival, then, of drainage, sewerage, and similar questions affecting the *collective health*, is due entirely to one of those stern reminders necessity every now and then gives us.

Hydrogeology, as we have seen, claims all the literature on rain-water after its fall, and as long as it remains underground. When on the surface, flowing or remaining stationary in masses, its study is what is ordinarily understood by Hydraulics and Hydrostatics.

On the smallest reflection it must be evident that there is a geography of lakes and rivers invisible, yet real, and well-nigh coextensive with their more familiar contemporaries on the surface, containing water, as a rule, of a superior quality, and from a more reliable source—the absorption of large areas. Obviously this Hydrogeology depends on geology primarily for its features; the various pervious and impervious strata, faults and fissures, are its factors, and from these its lakes, rivers, and fountains or springs arise. The lower valley of the Thames is a well-known example of such an underground lake, or series of lakes, one above the other, each defined or enclosed by an impervious stratum, in this case London Clay. When first tapped by artesian wells, an abundant, indeed quite overpowering, supply was in most cases had. As well by well was sunk in the same basin, the head in the older wells got reduced, wells half a mile distant affecting one another.

The permanent lowering of the London basin proved two very interesting points: First, that the supply stored was very much less in quantity than was previously supposed; and, by the way, this has been also found to be true of the Upper Chalk subsoil-water in Kent. Secondly, it expelled the idea of similarity to surface lakes or rivers. The permanent surface of these lakes need not be a plane, certainly not horizontal. It is true, when undisturbed by extraordinary accidents, such as fissures, wells, or porous strata, the top of the subsoil-water will approximate to a plane, either with a gradient or level.

One other general remark. Fissures are now admitted to be the main agents of transmission in the older rocks; even the Upper Chalk has no available supply for wells other than that due to fissures. When these are filled (as in the Plymouth district) with porous materials, we have a combination of laws due to the two distinct rocks, pervious and impervious. Generally, a system dependent on fissures; particularly, a delivery dependent on a porous material.

This district, for our purposes, is divisible into two areas, with little in common: I. The Shillat and Dunstone District; II. The Limestone District.

I. The Shillat and Dunstone District.

Commonly speaking, the planes of cleavage, and also of stratification, near Plymouth, dip south and south-east at a high angle;

so great has been the denudation that it is now a very difficult problem to identify recurvences due to folding back, if any. As pointed out by Mr. Worth,* several northerly dips occur beyond Mannamead, but in no wise to balance the southerly inclination. There are, however, a number of secondary contortions, and it is these which render cuttings in shillat, as it is locally called, very uncertain. The extreme form of these contortions, is a mass of rock more or less spherical, with laminations twisted most irregularly. These are met with from four or five to forty or fifty feet in diameter; and as the adjacent strata are frequently much displaced and broken, subsoil water lodges in and around them. This accounts for their tendency to fall, especially in wet weather.

Shillat is called "blue," "red," or "white," although the white is in reality of a greenish tint. This colouring, near Plymouth, coincides with the plane of cleavage generally, and the bands vary from inches to many feet in breadth. A very broad blue band may be seen in the railway cutting at Harwell Street. Shillat is closely packed, with very few transverse fissures; those bearing water are found between and in the plane of the coloured bands, and when open generally filled with a dull white spar. This spar, by no means confined to the planes of cleavage or to the larger fissures, darts through the rocks in every direction, and is frequently met with in large masses, with fissures converging from all points to the central mass.

Lipson Hill is known to be plentifully supplied with underground water from top to bottom; yet a well sunk by Mr. Pyper near the top had to be abandoned, not a drop of water being found. The well was 28 feet deep, and within less than 20 yards a most abundant supply exists. It so happened that this well came on a deep bed of red shillat, close, sound, and perfectly dry; no change of ground was come to, and none was anticipated.

Well-sinkers here have it, that to come on red shillat is a bad sign, and that there is less chance of water in red than in either of the other colours. This suspicion is only a comment on the general soundness and individuality of red shillat; which in this neighbourhood can be traced for miles on the surface, the quality also being kept up. It must therefore exercise no small influence on the underground water supply of the district. The fact of no water existing in it is the converse of the fact that there is a

* "Geology of Plymouth," *Trans. Plym. Inst.*, vol. v. p. 455.

plentiful supply at one side or other, or both, as circumstances determine.

A large cutting in Mount Gould through the blue and white rocks has also shown the very prescribed limits enjoyed by underground water. Only three or four springs have been met with, so sound is the rock, with very little spar and few changes. Sometimes a bed or mass of broken rock is come upon, the rock not having been removed from its original position, but fractured *in situ;* such broken rock always carries water.

One other instance to show how clearly defined the water channels are. During the construction of the Devonport Railway at Stoke, an excellent well was destroyed, and had to be replaced, a new one having to be substituted. A first attempt failed; on observing, however, a "weeping" in the face of the cutting, another well was put down six yards from the first, and successfully.

On the whole, the well-sinker's dictum, "water can only be looked for at a change of ground," is correct; and as spar is generally associated with an extensive change of ground or disturbance we can understand their prediction, that when spar is struck there is every chance of a plentiful supply of water. Many wells bear out the perfect truth of these statements. A well near the top of Stoke Hill was sunk for the first 10 feet through a firm clay, then through shillat, and was perfectly dry, till at a depth of 15 feet from the surface a bed of spar was struck, from which a plentiful supply was obtained without sinking farther.

Stoke generally has abundance of water underground, from wells sunk on an average 25 feet deep. The bands are not very broad; here and there is a frequent occurrence of fissures containing spar. Similarly, at Torpoint, there are many excellent wells, due to the same formation. Returning to Plymouth, we find the same to hold, more or less, for all the district near the North Road, and eastwards to the summit of the hill on which stands the Prison.

A well at Endsleigh Place, in the yard of Mr. T. Jinkin, contractor, may be taken as a fair specimen of the better class of common wells in this district, and indeed in the shillat generally. Here the ground rises towards the north, falls rapidly to the south, is level on the east, and falls on the west. There is an abundance of water, but this abundance was secured by driving a heading north against the dip for 12 feet, at a depth of 24 feet from the surface.

The supply was easily exhausted previous to driving this heading. The level of the water has not been altered by the heading, although the supply and storage have been very much increased, and it now on an average supplies, say four days after rain, 400 gallons per day. It does not fluctuate very violently with the rain-fall, and keeps up well in dry weather. All this points to an extended underground water-bearing fissure passing near this, and in the plane of cleavage of the rock.

The results of gauging in December, 1876, were as follows:

			To surface of Water from ground.		Rise.		Galls.
December	7th.	..	12′ 0″	..	——		
„	8th.	..	10 1	..	1′ 11	..	460
„	9th.	..	8 6	..	1′ 7	..	380
„	10th.	..	7 2	..	1 4	..	320
„	11th.	..	6 4	..	0 10	..	150
„	12th.	Rained	5 7	..	0 9″	..	133
„	13th.	Rained	4 10	..	0 9″	..	133

At this last height, or a little above, the water flowed off in the top broken rock. The water does not come from the roof, but mostly from the sides, and from the bottom; a considerable portion issues from the rock at the end of the heading. When excavating this the boring tools came on spar, and, judging from the surroundings, a rather extensive change of ground is close by. Thus it is held, that were the heading extended a short distance further, a very abundant supply would be had.

We see here at a glance the relative value of the shaft and the heading in collecting water; also the reason for the rule of the well-sinkers, "Always drive a heading north," or more generally, drive it against, and on the line of, the dip of the rock. Another maxim of theirs is, having sunk a well to water-bearing ground, gauge the quantity, and if it does not increase as the well is deepened, drive the heading as before. Rules may do very well for many operations; but well-sinking of all others is the most dangerous for their successful application. Such a rule as this last might stop sinking at the very point of success. In this district, I have no doubt, many cases can be cited upholding these propositions, only great care must be had in applying them. Obviously for each case the details of the surrounding geology, as far as they affect the passage of water, are of the first im-

portance. By disregarding them, a very great risk is incurred of ultimate failure. We must not, on the other hand, forget that the very existence of such rules tends to point out a remarkable uniformity of the rocks in this district; at any rate, as to the parallelism of water-bearing fissures broadly.

I alluded above to manufacturers in Plymouth, tanners and brewers mostly, requiring large supplies of water. This question has still for them a considerable pecuniary interest; and when extensive supplies are known to be within certain proximate limits, such as the water-bearing fissures at North Hill; the masses of dunstone, or other close rock, at Mannamead; or, as we shall see by-and-by, along and near the line of junction of shillat and limestone, a strong temptation to save a heavy rate, and gain an independent supply, is natural. It is needless to point out the immense direct value to the town of every large spring or well, especially when used for manufacturing purposes.

A great prejudice against springs and wells supplying towns has existed now for several years; and most valuable supplies are overlooked, mainly because some little investigation and special knowledge are needed to bring to light, and estimate rightly, these underground sources. In the present state of our knowledge generally on this point, we can still call a preference for reservoirs, filter-beds, &c. a logical weakness. Lately much has been said in favour of subsoil-water in reference to the future supply of the metropolis. The moral to provincial towns, as well as to London, is, "Do not neglect natural supplies in preference to a more imposing machinery; but utilize both. Encourage wells of the better class; but only of the better class." No more fruitful source of disease has been done away with than small surface-wells in towns. Even now the mortality of many villages in Devonshire is higher than it ought to be, and these ill-placed surface-pits called wells are accountable for most of this extra mortality.

Dunstone crops in very abruptly through the shillat on the north and north-west, as on Mutley Plain, just under the College, and in Fore Street, Stonehouse. At Mutley, the change is associated with a large bed of yellow clay of great age. Shillat is generally altered near dunstone, and much loosened. Mannamead is interlaced with dunstone, and in two conditions; mostly it is a hard, sound, homogeneous rock, seldom fractured, and perfectly

impervious to water; occasionally it is in a spongy state, and bearing plentiful traces of iron.

The shaft of a well at Lamorna Villa, Mannamead, through close and sound dunstone, was 15 feet deep, and perfectly dry. Below this, rods were used, and when boring at a depth of about 30 feet from the surface, the tool suddenly dropped a small distance, and quite a rush of water followed; indeed several of the tools in this well could not be removed, simply on account of the sudden rising of the water. Several instances of unsuccessful wells in the close dunstone can be cited, all showing that unfractured dunstone is a perfectly impassable barrier to subsoil-water, and that only where it is fractured, or in a spongy condition, can an outlet be effected. At Castle Compton House, Mannamead, in a well 21 feet deep, with a heading at this level 12 feet long in a north-east direction, spongy dunstone was exposed, and penetrated at the end of the heading. Water came freely immediately this spongy rock was struck, and in a short time filled the well to within four feet of the surface, where it remained. It was subsequently determined to cut further into this open rock, hoping thereby to secure a still greater supply; but two men, with two eighteen gallon casks mounted on a windlass, could not keep the water under. Both these wells are but slightly affected by weather, and show that the dunstone by disturbing the shillat, perfectly intercepting the subsoil-water—or, as with the spongy, providing a clear channel for the passage of the water—very much extends the natural collecting limit of the undisturbed shillat.

In a fissure where the frictional resistance to the water is constant, or, in other words, where the filtering materials in the fissure are uniform in size, the water will have a definite and uniform gradient. Where they are not uniform, there will be a series of gradients, precisely as in the well-known experiment in hydraulics.*

This explains how water may be had long after rain, and far above the outlet in open soils. We have a small example of this in Lipson Hill, where water is found at the very summit, and in tolerable abundance.

The discharge of subsoil-water is fixed by the direction of porous planes or other openings. As we have seen, these are very

* See "Theory of Stream Lines." By Wm. Froude, F.R.S., at Brit. Asso., 1875; "Nature," December 2nd, 1875., fig. xx. p. 91.

uniform in the shillat, which accounts for the frequency of very moist areas, both during summer and winter, on the east and west flanks of rising grounds. The west face of North Hill is much more damp than the north or south faces.

This suggests the difficult subject of percolation through soils. It is true values may be had for many typical soils and subsoils; but to apply such to a whole district or watershed without the greatest caution is dangerous. Very valuable information would be had by dividing rivers into similarly featured districts or lengths, and dealing with the differences of discharge for evaporation and percolation. Whether rain-water flows off in floods, or in more regular streams, depends to a large extent on the soil. Our experience of the common filter will tell us that, with a certain head, the rate of filtration depends on the depth of filtering medium, and on the fineness of the top layers. Allow a film of mud to form on the surface, and the filtration through the whole series, however porous, will be arrested. The herbage on the surface affects the meteorology of a country more than any other temporary and accidental feature. Meadow land has a tendency to increase percolation and evaporation greater in amount than forests relatively to its bulk. This is mostly due to its open cellular structure. Recent experience in irrigation has established beyond a doubt that the depth of top-mould or humus is increased and improved generally by irrigation, apart from the effects of sewage which the water may contain. Water, in descending through the soil, forces along with it the air in the ground, discharging it into the drains or other openings. On subsiding, a suction is set up, which can only be drawn on from the fresh atmospheric air. Thus the closest of soils are oxidised. Many owe their major portion of oxidation to this one process; and to this also rain owes most of its fructifying power. When the materials separated by oxidation, as in dunstone, are those favourable to growth, a rich soil is the result. Slate rocks do not decompose readily into a soil, although much softer, and more easily worn down, than either limestone or dunstone.

II. Limestone District.

At the junction of the limestone and slate rocks there is no very abrupt break. For instance, in the Railway cutting of the Sutton Harbour Branch at Laira Road Bridge, which is just on the division

line, the shillat becomes suddenly soft, and merges into a yellow clay in which thin layers of limestone appear, all within 30 feet. At other points we find alternate beds of shillat and limestone, as near Clarendon Place; also a bastard rock, as at Devil's Point and Millbay. Water is found plentifully all along the line of division, and in the limestone where bastard rock or slate occurs.

The Corporation Cesspit between Queen Anne's Battery and the Ropewalk is 20 feet deep in bastard rock, here associated with tapering beds of yellow clay. Abundance of water was found when excavating. This pit is near the division line. Following this line westwards, the well in Mr. Scott's brewery is the next of importance near it; here strata of slate alternating with clay are cut to a depth of 48 feet. Little or no limestone was met with so far as I can discover, but it is just outside the division line between the slate and limestone. Water is found in great abundance, of most excellent quality, and evidently in communication with an extended subsoil system, for during severe droughts it keeps up well. Several years ago this well was cleaned, when strong springs were seen bubbling up on the floor. The supply from below the level of the bottom of the well seemed to be greater than from the sides. The rate of rise was quite 2′ 6″ per hour at the lower part of the well; and as the shaft is 6′ 6″ diam., this makes the hourly discharge 500 gallons.

At the Messrs. Butchers' brewery on the left of Stonehouse Bridge, there is a well singularly like this one in Hoegate Street. It too is situated a few yards north of the division line, is 86 feet deep, and is driven through blue slate and spar, mostly white. I am inclined to think this white spar is quite distinct from the darker coloured spars of the pure slate rock, and owes its presence to aqueous deposition and not to igneous intrusion, as the spar in Mutley tunnel cutting does. Indeed the composition of the water almost proves this, for it contains salts procurable only from some such soluble rock. Dr. Letheby found here, Sulphate of Lime, Carbonate of Lime, Carbonate of Magnesia, Sulphate of Soda, Sulphate of Potassium. A uniform temperature of 54° Fah. is maintained winter and summer, and a never-failing supply, which is drawn on day and night, for the pumps here never stop. The five salts named above are enough to show a general similarity in composition to the waters of the Victoria Spa of the Royal Union Baths, formerly situated at the corner of Union Street and Bath Street.

The analysis quoted by Sir H. de la Beche in his "Report on the Geology of Devon and Cornwall" of this spa is given in grains in a wine pint of the water. The following are his quantities, reduced to parts in 100·00 :

Chloride of Sodium	63·72
Muriate of Magnesia	12·31
Muriate of Lime	9·95
Sulphate of Soda	6·29
Sulphate of Lime	5·91
Carbonate of Lime	1·36
Carbonate of Iron	0·46
	100·00

Total percentage of salts in water, 2·57.

Mr. Worth* gives a section of this well, which shows it to be on the line between the slate and the limestone, and rather into the limestone than the slate, as most of our previous examples in this division have been. The slate, he states, appeared to intrude in wedges, and from the section we find that the boring penetrated red sandstone. Unfortunately no record exists of the discharge and temperature. On placing alongside the last analysis that of average sea-water, we cannot fail to remark that much of the peculiarity of the Victoria Spa arose from some connection with the sea, directly or indirectly.

Sea-water contains about 3½ parts of saline matter in every 100 parts of water, consisting of the following salts:

Chloride of Sodium	75·786
Chloride of Magnesium	9·159
Chloride of Potassium	3·657
Bromide of Sodium	1·184
Sulphate of Lime	4·617
Sulphate of Magnesia	5·597
	100·00

In Messrs. Butchers' well salts of lime are predominant; in the Victoria spa chloride of sodium (common salt) is by far the most abundant.

The water used by Messrs. Polkinghorne and Co. in their brewery is obtained from a spring near the division line, 133 feet below the surface, by means of an artesian boring through limestone and blue slate-rock, terminating in sandstone. I give an

* "Geology of Plymouth," *Trans. Plym. Inst.*, vol. v. p. 459.

analysis of the water by Prof. W. Herapath, sen., F.C.S., of Bristol Laboratory, who has appended analyses of the waters of the two principal Burton brewers, with which Plymouth compares most favourably.

	Polkinghorne and Co.	Allsopp and Sons.	Bass and Co.
Carbonate of Lime.....	11·96	7·248	2·72
Carbonate of Magnesia	1·32	3·360	10·56
Chloride of Sodium	10·40	7·200	2·56
Chloride of Magnesium.....	4·16	0·480	..
Nitrate of Lime	1·60	..	3·68
Carbonate of Iron	a trace	0·118	..
Sulphate of Lime	24·64	25·080	54·88
Sulphates of Magnesia and Soda..	..	21·600	8·96
Total Grains in Imperial Gal...	54·08	65·286	83·36

Generally the most important wells in the whole district are in or near this division line, between the slate and limestone. I have included in the limestone area those wells which, though still in slate, are near the limestone, and affected by its contiguity. To determine the localities from which these wells are supplied is a work of much interest, but of very great difficulty. That their area of absorption is large cannot be doubted; for, unlike the London basin, we hear of no diminution in the better-known wells.

There still remain several belonging to this class well worth examining; but more time cannot be devoted to them in the present general sketch.

In the limestone district proper, in Pomphlett quarries, Oreston and Deadman's Bay quarries, where the rock is pure, no water is met with. This is due mainly to the very definite nature of the fissures, and their extensive ramifications in connection with the tidal waters; any water finding its way underground is conducted directly to the sea level. I said any water; for in limestone there is a natural process of cementation at work—the deposition of carbonate of lime as stalactite, by which veins and fissures are sealed up, only the very pronounced openings remaining.

Mr. Worth* thus quotes Mr. Pengelly on the Oreston caves: "Moreover he found that such portion of the roof of the cavern as remained was a mass of limestone breccia, made up of large angular fragments, cemented with carbonate of lime, and easily enough mistaken, without careful inspection, for ordinary lime-

* "Geology of Plymouth," *Trans. Plym. Inst.*, vol. v. p. 470.

stone, somewhat rich in coarse veins." The most casual observation on the ground will at once settle this process of cementation from the appearance of exposed fissures.

In Pomphlett quarries the rocks are very close ; *no* springs are met with, and little water circulates in the rocks. At low-water strong streams issue from the toe of the wharf wall opposite the quarries. These springs are salt when the tide leaves them, but become fresher as they run ; proving the existence of a small circulation from the surface. Semi-salt springs, such as the above, are very common on the limestone coast in this district. At West Hoe quarries a large semi-salt spring bubbled up from a fissure in the limestone, quite six inches in diameter, and, like the Oreston and Pomphlett springs, varied with freshes and tides in its composition. Similarly, when laying the Stonehouse sewer at the Millbay Docks, between the life-boat house and the shipyard, about nine feet below the present beach, and four feet below low-water level, a spring perfectly identical with that in the West Hoe quarry was struck. This stream penetrates a dyke of fine yellow clay about 18 feet thick, running in a southerly direction, and is of considerable importance, for it undoubtedly has something to do with the main natural drainage of the Stonehouse district.

The Stonehouse cavern is the central feature in the natural drainage of the Stonehouse district. Dr. Geach gives a very detailed description of this Cavern in an interesting letter to Lord Mount Edgcumbe, dated Plymouth Dock, March 1st, 1776, and reprinted in vol. vii of the "South Devon Monthly Museum," p. 153. Three distinct wells are here enumerated, and Dr. Geach gives an explanation of the discharge of the subterranean waters into Millbay which is correct, at least is borne out by other and independent evidence, such as the spring on the foreshore cited above. Again, Old Barrack Street well (Hare's brewery), now in the Marine Barracks, seems to afford us an intermediate link in tracing this outlet from the cavern to Millbay. This well is altogether 200 feet deep, 50 feet shaft, and 150 feet boring. Water was tapped at 185 feet from the old surface, and rose suddenly to within 30 feet of the ground, and maintained this level. At this point (185 feet below surface) the rods suddenly dropped several feet, and the boring ended in a red standstone similar to that at Mount Edgcumbe. The boring was in a stratum of slate at a high angle, and enclosed on both sides with limestone.

Compare this with Dr. Geach's account of the wells in the cavern :

"It is not certain whether those wells, though they lie below the extremity of the limestone, have a mutual communication or not ; but it is highly probable, as the bottom of the largest well is clay and its sides are shelvy slate, that these are springs ; and it is certain that this shelvy vein of slate, nearly the same kind and colour with some seen at Mount Edgcumbe on the opposite shore, is continued even to the sea, where two openings at low-water have been found, through which it is probable the water of the great well discharges itself."*

No wells of any importance in limestone deliver water above sea-level; if so, some special consideration can generally be found. If the outlets are smaller than would pass the late rains, the water in the cavern at Stonehouse will now be much above its normal level. Again, a small well opposite West Hoe Cottages, on the crest of a limestone cliff, owed its water to a bed of bastard rock.

In Stonehouse, little or no water is to be expected above sea-level. Attempts have been made to tap the main supply at other points. This in limestone is a very uncertain undertaking; for it is possible, indeed it has been done, to bore a deep hole, and not strike a water-course. Properly looked for, a magnificent supply will be found here, as shown by the Millbay springs, and the cavern wells.

Finally, the rising and falling of subsoil-water, and spasmodic discharges at various levels, force on us a few words about contamination. In Plymouth, contamination of subsoil-water is very dangerous, more so than in a porous and homogeneous soil. We have here the water flowing in prescribed spaces, very frequently in ducts. It is fortunate, in one sense, the effects of contamination are so prescribed; but not so that it may completely foul other wells, or discharge itself in tenements. Springs frequently appear in basements, and cause much damage; St. Matthew's Church is a case in point. A well in the cellar has lately flooded the floor ; and were this water previously contaminated, the results might be fatal. In limestone, subsoil-water is collected in large quantities more or less stagnant, and about the sea-level, as in Stonehouse. Fortunately, on its way to the sea it never approaches the surface.

* See Appendix I.

Many houses in Emma Place, &c. use the cavern there as a cess-pit, a highly dangerous experiment for the locality. Little danger would be apprehended if these discharges found their way directly to the wells; for then the high road to the sea would have been reached. Injecting refuse into a limestone cavern, over which stand houses, irrespective of the water communication, is a reckless proceeding. In these caves the temperature is often several degrees higher than the atmosphere, as may be verified by a visit to Oreston quarries on a cold, sharp day, where a volume of vapour is seen rising from the mouth of a cave exposed in the government quarries. The temperature is at once felt by the hand to be higher than the outside atmosphere. These are just the conditions for decomposition of the sewage matter injected, while the spacious cavern forms a commodious gasholder or accumulator, dependent either on the atmosphere or the tidal waters for its discharge.

APPENDIX I.

Extract of Analysis of Water from two Wells at R.M. Barracks, Stonehouse, in January, 1868, by Dr. Letheby.

Both the samples were quite bright, but when examined in large volume they were found to be coloured with organic matter; No. 1 (Hare's Brewery) having an olive-brown colour, and No. 2 (Clerk's Old Brewery well) a yellowish-green tint. They were quite free from lead, and were therefore in this respect unobjectionable. The constituents per imperial gallon were as follows; and for comparison I have added the composition of the New River water supplied to the metropolis.

Constituents.	North Well. No. 1.	South Well. No. 2.	New River Water.
	Grains.	Grains.	Grains.
Carbonate of Lime and Magnesia	7.17	11.21	12.58
Sulphate of Lime	6.68	6.39	2.41
Alkaline Chloride (common salt)	5.58	9.77	1.28
Alkaline Nitrate	0.80	5.99	2.08
Silica and Alumina	0.75	1.00	0.38
Organic matter	0.51	0.47	0.32
Total per Imperial Gallon	21.49	34.83	19.05
Ammonia ready formed	0.029	0.014	0.000
„ from organic matter	0.030	0.015	0.002
Total Ammonia per Gallon	0.059	0.029	0.002
Oxygen required to oxidise the organic matter in a Gallon	0.064	0.059	0.050
	Degrees.	Degrees.	Degrees.
Hardness before boiling	9.0	17.0	14.0
„ after boiling quarter of an hour	7.5	11.0	4.0

These results show that both the samples of well-water from the Marine Barracks are charged with matter derived from surface drainage; and the large amount of alkaline chloride, and in the case of well No. 2 of nitrate, as well as the excessive proportions of ammonia, indicate the existence of sewage matters, which have become more or less changed during their passage through the ground in which the wells are sunk. I would advise therefore that both of the wells be abandoned, as far as the use of the water for drinking purposes is concerned.

Extract from Report of Professor F. A. Abel on samples of same water. January, 1868.

Analysis of water of wells shows that the water cannot be considered wholesome for drinking purposes. The proportions of organic matter in both samples are not high, but they appear to be derived from drainage, and this conclusion is supported by the fact that both waters contain large proportions of nitrates ; that in the north well amounting to five grains per gallon, while in the south well the proportion is 11·49 grains per gallon. The water from the north well is suitable for detergent purposes ; that from the south well is considerably harder, and is not appreciably softened by boiling. The water from Devonport Leat is perfectly wholesome, and in all respects well suited for general domestic purposes. It contains only 3·3 grains of solid constituents per gallon, a very small proportion of which (0·2 grains per gallon) consists of organic matter of peaty origin. Only traces of nitrates are present, and the water is very soft.

APPENDIX II.

Extract from Report to General Board of Health on the Borough of Plymouth, by Robert Rawlinson, Esq., 1853.

Analysis of water taken (March 10th, 1852) from the Plymouth Leat before entering the town, and immediately after heavy rains, by Mr. T. Spencer, Laboratory, 87, Upper Stamford, London. The water remained exposed to the sun and perfectly still four weeks, with the following result :

Sulphate of Lime	4.84
Carbonate of Lime	1.08
Carbonate of Magnesia	0.77
Chlorides (Sodium and Magnesium)	2.00
Iron, Alumina and Silica	1.20
Organic Matter	0.95
Total Grains of solid residue in a Gallon	10.84

The average hardness is 6·5 by Dr. Clark's Soap test, which being chiefly due to Sulphate of Lime, the water does not become sensibly softer by boiling, or on the application of quick-lime On the addition of an equal bulk of distilled water it is however reduced to 4 degrees of hardness.

Dr. Letheby's Analysis, dated 17th December, 1863, of Plymouth water as supplied, is as follows :

PLYMOUTH WATER AS SUPPLIED TO THE INHABITANTS.

	Grains.
Carbonate of Lime and Magnesia	1.05
Sulphate of Lime	0.91
Alkaline Chloride	1.22
Alkaline Nitrate	0.41
Silicia and Alumina	0.51
Organic matter	0.40
Total Grains in Imperial Gallon	4.50

THE INDUCTIVE PROCESS.

ABSTRACT OF MR. ROBERT SMITH'S PAPER.

(Read February 1st, 1877.)

This paper had for its object the discussion of some points in the philosophy of induction as enunciated by Mr. John Stuart Mill, who appears to claim as its result apodictic certainty, and can see no difference between the infallibility of a mathematical proposition and one which, being the result of a well-grounded induction, is termed a law of nature.

The importance of the subject was enforced as being the basis of all scientific thought.

The method of induction, which aims at the establishment of universal propositions from the examination of a number of individual cases, was illustrated by a supposed bag-full of unknown articles, and the gradual withdrawal and examination of the contents, one by one; and it was shown that any proposition concerning the nature of the whole contents would possess a degree of probability increasing with the number drawn, but only becoming certain on the drawing of the very last article; and if the bag contain an infinite number, no such certainty could ever be attained, although the probability would increase with every fresh corroboration.

Thus, supposing one article be drawn, and be found with certainty to be an apple, then we may affirm all the rest of the unknown articles to be apples also. But this proposition will possess only a low degree of probability, which however will increase with every fresh corroborative draw, and will ultimately become certain when the last one has been examined; until then, we can never be quite sure that the next draw may not be an orange, or a peach. If therefore the contents be unlimited, we never attain certainty at all, although we constantly approximate it.

This point was illustrated by diagrams explanatory of the mathematical notions of a curve and its asymptote, and the doctrine of

ultimate ratios, by which an arc is said to be ultimately equal to its chord; and the very best generalizations from experience—those which are the unexceptional exponents of *all* experience on the subject—were compared to the curve and the arc, which ever tend more and more to become coincident with the asymptote and chord respectively, but never become quite so.

Mr. Mill distinctly states that the operation for which he claims certainty is not the method which consists in the complete examination of every included case, which, although formally certain, is quite abortive as an attempt to add to our stock of knowledge.

His induction is, "Without doubt a real process of inference . . . . . its conclusion embraces *more* than is contained in the premises." It is "more than a summing up of what has been specifically observed in the individual cases which have been examined; it is a generalization grounded on those cases, and expressive of our belief that what we there found true, is true in an indefinite number of cases that we have not examined, and are never likely to examine." (*Logic*, vol. i. p. 187.)

Applying the above illustration, Mr. Mill's induction is of the kind in which, the contents of the bag being unlimited, we predicate something of the unknown contents, by virtue of the knowledge we possess of the ones we have examined, and not of the kind in which, the number being limited, we examine the whole, and embody the result in a proposition.

Now it is evident that we should have no warrant in drawing such a conclusion, except only as a probability, unless we had some previous reasons for knowing that the articles were all alike. If we knew that the fruit in the bag were all of the same kind, we should be justified in concluding them to be all apples after we had seen a few only as a *sample* of the whole.

It is from this principle that the modern system of induction, as compared with the ancient, derives its superiority. Archbishop Whately has remarked that every such induction may be thrown into the form of a syllogism, of which the major premise is a proposition affirming the uniformity of nature, which when examined resolves itself into the generalization known as the law of universal causation.

Whence then does this law derive its validity?

From another induction surely, says Mr. Mill; but from one which is co-extensive with all human experience. Let us grant

that such is the case; it will then only warrant us in applying the results over the same ground as that covered by the experience from which it was collected.

Mr. Mill does indeed admit as much, when, after saying (*Logic*, vol. ii. p. 103) "The law of cause and effect being thus *certain*, is capable of imparting its certainty to all other inductive propositions which can be deduced from it," he goes on to say (p. 106), "It must at the same time be remarked, that the reasons for this reliance do not hold in circumstances unknown to us, and beyond the possible range of our experience. In distant parts of the stellar regions, where the phenomena may be entirely unlike those with which we are acquainted, it would be folly to affirm confidently that this general law prevails, any more than those special ones which we have found to hold universally on our own planet. The uniformity in the succession of events, otherwise called the law of causation, must be received not as a law of the universe, but of that portion of it only which is within the range of our means of sure observation, with a reasonable degree of extension to adjacent cases. To extend it further is to make a supposition without evidence, and to which, in the absence of any ground from experience for estimating its degree of probability, it would be idle to attempt to assign any."

If then it be idle to apply the law of causation to regions which distance in *space* hides from our view, how are we warranted in applying it (except only as a probability) to those regions which *time* prevents us from examining—the events of the future and pre-historic past?

The fact indeed appears to be, that we are strictly warranted in claiming only a degree of probability for any knowledge that we possess of even the existence of the exterior world (as the supposed cause of our sensations), which has resulted from an experience as yet unfinished, and that we are even precluded from forming any estimate of what this degree of probability may be as related to certainty, which would be the result of an induction from an *eternity* of all experience past and future, and co-extensive with all space. Even the Law of Causation and the proposition which affirms the existence of matter can be only held as provisionally true, but are not capable of demonstration, as is a purely mathematical proposition. Still we can estimate the relative degrees of probability which such propositions possess among themselves; and

as one of the most firmly established is the Law of Causation, the modern method—for the systemization of which we are so much indebted to Mr. Mill—connecting small and weak inductions with this great and firm one, possesses a vast superiority over the ancient by so greatly increasing the warrant for believing the results of such otherwise precarious reasoning.

It must, however, be remembered that our inductive conclusions being thus of the nature of probabilities, and as such specifically different from actual certainties, are not capable of being used, like the first principles of mathematics, as a basis for an immense superstructure of deductive reasoning, except to such an extent only as the results may be verified by further observation or experiment.

Are then the mathematical sciences apodictic?

Perfectly so as long as they remain *pure*. And the lecturer is inclined to believe that they derive this peculiar property from the formal certainty of the induction by complete enumeration. They are all strict deductions from a very few first principles exceedingly simple, which although suggested to the mind by experience of concrete instances, are no longer the mere mirrored reflexion of those fallible cases, but have become purely subjective abstractions, superior to and independent of the concrete; and being thus wholly contained in the mind, and of a limited character, have been made the subject of a complete examination, which cannot be done with the unlimited object world. They retain their apodictic character only so long as they remain strictly subjective, and are often liable to defeat when applied to the concrete. We can postulate as a subjective possibility the existence of two parallel lines, but can never satisfy ourselves by measurement that any two actual lines are rigorously such. So too it is impossible in the abstract, but that when equals are added to equals the wholes shall be equal; but if we test this axiom as regards space by adding together two pints of water on one side of the equation and a pint each of water and sulphuric acid on the other, it will be found that its application is defeated, although it is from concrete objects like a pint of liquid that the abstract pint of space was first conceived. The pure mathematics are purely subjective, which is the real ground of Sir William Hamilton's objection to the influence of an undue preponderance of mathematical study in the formation of character.

The lecturer concluded by applying his views to show the

untenable nature of the positions taken by the idealist who denies the existence of matter as an objective reality, and the materialist who denies the existence of anything else but matter, holding that while the existence of matter as the cause of our subjective states is by far the most probable hypothesis we have as yet succeeded in framing on the subject, the existence of something which is not matter, but capable of acting upon, and being acted on by it—an extra physical world, a world of life and mind—is one also possessing a very high degree of probability, although much lower than the former. Neither is capable of apodictic demonstration; the difference in the certainty of the two propositions is one of degree, and not of kind.

THE EPICUREAN AND STOIC.

BY MR. W. F. COLLIER, VICE-PRESIDENT.

(February 8th, 1877.)

Under rule 44, Mr. W. F. Collier, Vice-President, introduced as a subject for discussion "The Epicurean and Stoic—the Modern Man of Pleasure and the Puritan." The following is a summary of his argument:—

From the earliest times, when different modes of social life were observed and studied, to the present, the two opposite theories represented by the Epicurean and the Stoic, and the Modern Man of Pleasure and the Puritan, have been subjects of contention and dispute, sometimes leading to violent animosities and hatreds. Epicurus himself, the founder of the school of Epicureans, must not be confounded with his followers, who, like many followers and disciples of great leaders, exaggerated, altered, and altogether transformed the principles propounded by their chief. Epicurus merely held that life ought to be enjoyed, and in practice was rather stoical than otherwise, with that end in view. The Stoics held that nothing in life was enjoyable except what was purely intellectual, and indulged themselves with the idea that a Stoic could, when stretched on the rack, revel in the enjoyment of intellectual pleasures. Both these social schools have held their opposite theories from the time of Epicurus, and probably long

before, until now; and they were brought very prominently into notice at the time of the Cavaliers and Puritans under the reign of the Stuarts. At that time the name Puritan became a word of reproach, in consequence of the excesses and cant prevalent among the Puritans; but it is high time that it should be restored to its original signification as a derivation from the word *pure*, meaning, as it ought to mean, one who leads a pure life. The most notable instance of the modern Puritan is found in the Society of Friends or Quakers, whose pure, quiet, and blameless theory of social life is not sufficiently appreciated. They, however, as well as all modern Puritans, are approaching neutral ground on the principle of compromise, and now indulge in the pleasures to be derived from all the fine arts—painting, music, &c. &c.—except dancing. The Man of Pleasure also is not the reckless, wanton debauchee that he was, but he approaches the Puritan in his moderation. The pursuit of pleasure itself, however, has its Stoics, distinct from the Puritan. Many sportsmen are very stoical for the sake of their sport; and the jockey, though not a Puritan nor in pursuit of his own pleasure, must be, from the nature of his calling, a complete Stoic. The Man of Pleasure demands for the sake of his pleasures Stoicism if not Puritanism from others. His pleasures, unlike the pleasures or the happiness—words of two very different meanings—of the Puritan, require sacrifices from others. The consideration therefore of the rival merits of the two schools seems inevitably to lead to a conclusion favourable to the Puritan and against the Man of Pleasure. In view of the sacrifices made by so large a proportion of the population, and the misery and privation endured by so great a majority in modern social life, it would seem that the severe Puritan, and not even the modern example of the prevailing tendency to compromise, will be the only possible Man of the Future.

THE REPORT OF THE FACTORY AND WORKSHOPS ACTS COMMISSION, 1875–6.

ABSTRACT OF SIR GEORGE YOUNG'S PAPER.

(Read February 15th, 1877.)

The object of this Commission was to consider the working of the Factory and Workshops Acts, with a view to their consolidation and amendment. The matters referred to it may be divided into three heads: (i.) How to consolidate and simplify the fifteen Factory and Workshops Acts; (ii.) What amendments it was desirable to make in the existing law; (iii.) Whether any new occupations and industries ought now to be brought within the control of the law.

(i.) The Commissioners found the law so constituted, that the occupations at present regulated were ranged upon three *planes*, representing different degrees of strictness in regulation. These were (1) Textile Factories; (2) All other "Factories;" that is, *all* places of work in certain specified trades, and all which employed 50 hands in the rest; (3) "Workshops;" that is, all places of work *not* employing 50 hands, in the trades not specified under (1) and (2). They recommended the abolition of the distinction between (2) and (3); but not, generally speaking, of that between (1) and (2).

(ii.) Considered with reference to the subject matter of the law, there are three branches into which it may be divided: (*a*) Regulation of hours of labour; (*b*) Educational provisions; (*c*) Sanitary provisions. The Commissioners recommended amendments of the regulations of the hours of labour in a few cases. They proposed to transfer the bleaching and dyeing trades from Class (2) to Class (1). They endeavoured to simplify, without seriously reducing, the privileges given to particular trades and establishments by way of relaxation or modification of the law. They endeavoured to provide remedies for one or two grievances and abuses which

appeared in the course of the evidence. Their Report goes to show that in this respect not much alteration of the law is called for. In Educational matters, they considered that much was required, and that the strictest regulations—those of Class (1)—ought to be enforced in all the Classes. They recommended, moreover, that, outside the Factory Acts, the Educational law should be at once completed, by the establishment of universal direct compulsory attendance; thus changing the aspect of the special provisions of the Factory Acts, known as the half-time system, from one of exceptional stringency, to one of exceptional privilege, and of indulgence in favour of industry. In Sanitary matters, they recommended the extension of the most efficient provisions applicable under the present law, and the introduction of a few others.

(iii.) The principal fields of labour suggested as proper to be now placed under regulation are those of agriculture, service in retail shops, and employment on canals. The Commissioners did not approve of the extension to any one of these of the regulations as to hours of labour. The education of the children therein engaged they recommended should be secured by the general Educational law; and the necessary sanitary regulations they desired to see enforced by the general Sanitary law. In some exceptional cases they recommended an extension of the Acts, but only when "handicraft labour by protected persons upon definite premises" was in question. For sanitary and moral reasons, they recommended that the prohibitions of particular kinds of labour to children and young girls, but not to adult women, should be somewhat extended.

The points selected to be specially dwelt on in the lecture were: A defence of the Commissioners' recommendation as to (A) The stricter regulation of "Workshops," by the enforcement of the legal "Working Day" of twelve hours, *within* which all work must be taken; (B) The refusal to extend to all factories the limit to ten hours of the working *time*, now enforced in Textile Factories, in place of the limit to ten and a half hours, now enforced elsewhere; (C) The refusal to extend to Retail Shops the principle of Factory Act Regulation; (D) The maintenance of the *status quo* in respect of the restrictions on adult female labour. The important recommendations of the Commissioners in respect of Education were not, on this occasion, discussed by the lecturer.

LANGUAGE: THE CONTRAST IN ITS DEVELOPMENT IN MAN AND BRUTE.

ABSTRACT OF PAPER BY REV. J. ERSKINE RISK, M.A.

(Read February 22nd, 1877.)

It treated of the various kinds of language, different modes of action of the mind, origin of concepts and abstract terms. Question as to the reality of roots and concepts; Müller's examples of roots. The three stages of language; two theories as to its origin; the bow-wow and ding-dong theories. Roots and interjections distinguished, and origin of roots. The real barrier between man and brute. Different opinions as to the seat of articulate language; their bearing on Darwin's theory. Are there any well-authenticated cases of savages without language? The infant's mode of acquiring speech, and relation of this to the present subject. Steinthal's theory of conditions of development of rational articulate language. Final contrast of manner of development of human and brute language.

THE KINDERGARTEN.

ABSTRACT OF PAPER BY THE REV. F. E. ANTHONY, M.A.

(Read March 1st, 1877.)

The lecturer treated of the principle of the kindergarten; the speciality of its method. Meaning of the term. Froebel's purpose in the establishment of kindergartens; age at which a child should be placed there; reasons for this. The philosophy of play; its relation to Froebel's method. Nature taken into partnership. The practical working of the kindergarten. Froebel's six "gifts;" additional gifts; stick-work, paper-work, clay-modelling. Objections to the kindergarten: (1) Its sameness and tendency to repress mental growth. (2) Children not usefully employed nor prepared for school. Testimony from schools in Germany. (3) The difficulty of getting suitable teachers.

THE PROGRESS OF SANITARY SCIENCE.

ABSTRACT OF PAPER BY MR. GEO. JACKSON, F.R.C.S.

(Read March 8th, 1877.)

The object of the paper was an argument whether sanitary science had advanced, or rather—had its results yet become appreciable? Was it not the want of sanitary knowledge amongst the public generally, rather than the unadvanced state of the science, which prevented the good which would result from its application being more appreciable? The lecturer then suggested remedies, suggesting that means should be taken to diffuse a knowledge of the laws of physiology, and their bearings on the preservation of health; a better organization for the sanitary administration of the country; a more compulsory enforcement of the laws for the prevention of the pollution of the air and water, and for the providing of better dwellings for the poor; more definite precautions to be taken to prevent the spread of contagious disorders.

A PLEA FOR THE CREDULOUS.

ABSTRACT OF PAPER BY REV. J. M. HODGE, B.A.

(Read March 15th, 1877.)

Object of the lecture: Definition of "the credulous" who were pleaded for; modern necromancy; apparitions, omens, and dreams; traditional subjects of credulity; credulity in the abstract.

THE PHYSIOLOGY OF VISION.

BY MR. W. SQUARE, F.R.C.S., F.R.G.S.

(Read March 22nd, 1877.)

The lecturer described the anatomy of the retina, showing that such complicated functions as were exercised in seeing required a very complex organ to produce them. In the small space occupied

by the thickness of the retina no less than ten different layers were found, and the lecturer described the optic nerve, its fibres, and the method of their position, showing that they were not the recipient layers. Gradually excluding all other layers, he came to the layers of rods and bulbs, which he showed from the position to be the true visual layers of the organ. The other layers were briefly described, but only to show that they could not be the true recipient layers. He then proceeded to explain how the rays of light entering the eye first impinged on the posterior layer of rods and bulbs, passing through the other anterior ones. The structure of the macula lutea, or yellow spot, was accurately described, and its differences from other regions pointed out. The theories of Max Schultze as regarded the action of the retina were spoken of at some length, as was also the comparative anatomy of some of the component elements. The analogy between the retina and the other organs of special sense was referred to, and especially as regarded the rods and bulbs. The subject of appreciation of colour was opened up. It was shown that in some animals globules of oil were placed in the cones, of different colours. It was supposed, according to the law of Helmholtz, that the nerve fibres in the coloured cones would only vibrate synchronously with rays of light of the same colour as in the organ of Corti, that certain nerves only vibrated synchronously with certain sounds. This hypothesis had been, however, broached years ago—in 1820—by Dr. Thomas Young. The phenomenon of colour blindness was spoken of, and a hope was expressed that through this disease further investigations as regarded the physiology of vision might prove useful. The lecturer spoke at great length on the subject of alteration of impressions, especially during their passage through the layers of rods and bulbs, viz., of light into nerve force. The retention of retinal impressions was spoken of, and the theory of complementary colours gone into, Mr. Square regretting that the facts at hand were so few. The laws of Helmholtz on the subject were criticised, and generally agreed with. Many other phenomena, as the heightened effect of colours by contrast, the duration of impressions, and the habit of observation, were touched upon. Stereoscopic vision was explained, as well as the use of many instruments, such as the zooscope, stereoscope, ophthalmoscope, &c. Mr. Square concluded with an inquiry into the theory of inversion of the retinal image.

SIR WALTER RALEIGH.

ABSTRACT OF LECTURE BY MR. R. COLLIER.

(Read March 29th, 1877.)

THERE is perhaps no period of English history which Englishmen of every shade of opinion look back upon with greater pride than the reign of Elizabeth, and assuredly of all Englishmen the men of Devon have most reason to cherish the records of that time.

We remember all the dealings with the Armada, from the sinking of the first Spanish ship off the Eddystone to the collapse of the expedition; and the victory is so complete, that it does not occur to us that the result could ever have been doubtful. But three hundred years ago the dangers of a Spanish invasion were by no means lightly regarded. Raleigh, as Lord-Lieutenant of Cornwall, and Vice-Admiral both of that county and of Devon, had made a careful survey of both counties; and at his suggestion it had been decided, in case the Spaniards should be able to land in any force, not to risk a pitched battle, but to harass them in the flank, and lay waste the country in front of them.

The career of Sir Walter Raleigh possesses a unique fascination for the biographer. There is a veil of mystery surrounding his connection with the principal men of his day which stimulates curiosity; and his moral character, so far as it is revealed to us, forms of itself a most interesting study. Generally resolute and daring, and above all, noted among his contemporaries for being "damnable proud," at times all these qualities seem to have forsaken him, and we see him revealed in the light of a cringing suppliant, prizing life, and even riches, more than all these things which alone make life desirable. And yet at last he did not shrink from death; indeed, nothing in his life became him more than the leaving it. It is difficult to recognize in the old man on the scaffold, bowed down with sorrow and sickness, meeting death undismayed and cheerful, the same Raleigh who in middle-life wrote letters in fulsome adulation of the justice and mercy of James I., just after that monarch had obtained his conviction for high treason by as gross a perversion of justice as

ever disgraced the annals of English law. It is only fair to say that he soon repented of the unworthy and undignified attitude he had assumed—an attitude which he attributed entirely to the entreaties of his wife.

Judged by the present standard, Raleigh's conduct would in some particulars deserve severe condemnation. He not only gave, but took large money bribes; but he never made use of bribery to compass any dishonourable end, which is more than can be said for many of the principal men of his time. Robert Cecil, for instance, lived and died a pensionary of Spain. It is distressing to think that the principal statesmen of that day should have been open to such a gross form of bribery.

Perhaps the most amiable trait in his character was evinced in his treatment of the American Indians, whom he governed justly and mercifully, and by whom he was long held in affectionate remembrance.

After the death of Drake, he was incomparably the first of living commanders, both by land and sea. At once the Nelson and the Wellington of his day, to the love of adventure and enterprise he added a capacity for statesmanship, literature, and oratory, rendering him alike conspicuous in the Council Chamber, in the House of Commons, as a poet, as a philosopher, and as a historian. When we speak of the great commander, the great discoverer, and the great colonizer, we must remember that we are speaking of one who was also the intimate friend of Ben Jonson—of one who had Edmund Spenser for a dedicator, and Milton for an editor.

Sir Walter Raleigh was born, in the year 1552, at Hayes Farm, in the eastern corner of Devon. He was a Devonshire man to the backbone, and spoke with a broad Devonshire accent to his dying day. His father, Walter Raleigh, was a person of small means, but descended from an ancient and honourable Devonshire family. His mother was a daughter of Sir Philip Champernowne, of Modbury, and the widow of Otho Gilbert, by whom she had three sons, all of them knights; namely, Sir John, Sir Adrian, and the famous Sir Humphry Gilbert. By Raleigh she had, besides Sir Walter, another son, Sir Carew Raleigh, and a daughter. Her eldest brother was Henry Champernowne, of Modbury, who distinguished himself in the Huguenot wars; and her next brother was Sir Arthur Champernowne, of Dartington.

Raleigh claimed relationship with many great families. He reckoned among his kinsmen the Earls of Bedford and Totnes, and Lord Hunsdon. He began life, then, with very little money, but with good connections. We know nothing of his early boyhood. At the age of fourteen he went to Oriel College, Oxford; but left without taking his degree.

When only seventeen he began his military career in France, under his uncle, Henry Champernowne, who commanded a band of volunteers on behalf of the Huguenots. He remained in France about six years; that is, from 1569 to 1575. There is scarcely any record of his services during those eventful years. On his return from France he took chambers in the Middle Temple; but his legal reading was merely nominal. During the interval of some four years and a half that elapsed previous to his campaign in Ireland, he employed in maritime studies all the time he was willing to spare from the pursuit of pleasure. The fruit of these studies appeared in the year 1577 in the shape of a "Discourse" addressed to the Queen, and written in concert with his famous half-brother, Sir Humphry Gilbert. The scheme set forth by the two brothers does not impress one with a high idea of the tone of public morality then prevalent. The Queen was advised to send out two fleets—one as secretly as possible, carrying five or six thousand men, the other consisting of a few ships ostensibly for purposes of exploration. The two fleets were to effect a juncture, and then to capture the Spanish, French, and Portuguese shipping at the fisheries of Newfoundland. With the plunder thus obtained it was calculated that a much larger fleet might be fitted out, sufficient to dispossess the Spaniards in the West Indies. The Queen was of course to disclaim all knowledge of the enterprise, and even to denounce the adventurers as pirates.

By the autumn of 1578 Gilbert had collected a fleet of eleven sail, manned with five hundred sailors and soldiers; but the crews misbehaved themselves, and a bad example was set them by their officers, some of whom deserted with their ships and crews, and so on the 19th of November Raleigh and Gilbert were obliged to set sail from Plymouth harbour with only seven ships and three hundred and fifty men. The expedition was not destined to be successful. In the spring of 1579 the little fleet was defeated by the Spaniards, and one ship taken; but notwithstanding this reverse, at the return of the two brothers in the early part of the

summer, their courage and enterprize gained them great credit. It is conjectured that during this voyage Raleigh visited Virginia. In the early part of 1580, when nearly twenty-eight years of age, Raleigh began his famous campaign in Ireland. At the head of a small body of men—a few musketeers and a few cavalry—numbering in all about one hundred, and sometimes much less, though bold to rashness, and in the midst of a hostile population, he never suffered a reverse, and performed exploits which read more like fairy tales than sober history. I cannot pass over without notice the part he took in the massacre of Del Oro. Del Oro was a fort thrown up near Smerwick by Spaniards, Italians, and Irish rebels. The garrison refused to surrender to Lord Grey of Wilton, Lord-Deputy of Ireland, replying to his summons that they were there by command of the Pope, who had taken Ireland from his heretical mistress and given it to the King of Spain. However, they were soon obliged to surrender at discretion, and with very few exceptions the whole garrison, numbering five or six hundred men, and a few women, were massacred in cold blood. Raleigh was one of the officers deputed to see the orders of Lord Grey carried into effect. It was a terrible lesson, and one the Spaniards never forgot. They never again effected a lodgment in Ireland. The Queen expressed her entire approbation of what had been done.

We now find Raleigh with an established reputation taking a prominent part at Court. He soon became as distinguished as a courtier as he already was as a soldier. He secured with very little difficulty a high place in the affections of the Queen. Raleigh was still on colonizing schemes intent; but as the Queen would scarcely let him out of her sight, he was obliged to content himself with fitting out expeditions that were not personally conducted. The year 1583 is memorable for an expedition under Sir Humphry Gilbert, in which that gallant commander lost his life, his little ship being swallowed up in mid-ocean during the night, and lost with all hands. In the following year Raleigh obtained from the Queen a charter of colonization, somewhat similar to, but more beneficial than, a previous charter granted to Sir Humphry. It empowered Raleigh to take possession of and colonize on behalf of the Queen remote heathen and barbarous lands not actually possessed by any Christian prince nor inhabited by Christian people, and to enjoy the soil of such lands, only reserving for her Majesty's

use one-fifth part of all ore of gold and silver. Armed with this document, Raleigh promptly sent off an expedition under Captains Amadas and Barlow, who were the first colonizers of Virginia. By the end of March, 1585, he equipped and sent off from Plymouth harbour, under the command of Sir Richard Grenville, a fleet of seven sail, with one hundred householders, and many things necessary to begin a new state. About this time Raleigh entered upon new duties, being returned to Parliament for the first time as one of the members for Devon. In Parliament, as elsewhere, he speedily came to the front. We hear him spoken of as the first orator of his time; and in addition to this element of distinction, the scanty records we possess show him to have held sound views far in advance of his day. He contended strenuously in opposition both to Robert Cecil and to Bacon for the repeal of the statute of tillage. After observing that France had offered to supply the Queen with corn in Ireland at a rate at which the English farmer would be beggared, he said, "The Low Countrymen and the Hollander, who never sow corn, have by their industry such plenty that they serve other nations. I think the best course is to set corn at liberty, and have every man free, which is the desire of a true Englishman." He argues further, concerning religious persecution, that men's actions, and not their intentions, are properly the subject of penal laws. He says, "The law is hard that taketh life or sendeth into banishment where men's intentions shall be judged by a jury, and they shall be judges what another man meant. But that law that is against a fact is just." Raleigh also opposed a bill for the more diligent resort to church on Sundays, which was thrown out by only one vote.

During the ten years immediately following his return from Ireland, at the end of 1581, Raleigh's career at Court was one uninterrupted success. He was given at various times large and very profitable grants of licences to export broadcloth. He had the exclusive privilege of licencing vintners throughout the kingdom except in London and Cambridge; but, strange to say, this monopoly, even with leave to compound with offenders, only brought him in about £1,000 a year, equal to about £5,000 a year now. In 1585 he succeeded the Earl of Bedford as Lord-Warden of the Stannaries, in which capacity he used to hold a parliament of miners under the lee of some Dartmoor tor.* Soon

* "Crockern Tor."—Ed.

afterwards he was appointed Lord-Lieutenant of Cornwall, and Vice-Admiral of that county and of Devon. He was then made Captain of the Guard, a place more of honour than of profit. He was granted 12,000 acres of forfeited land in various parts of Ireland; and finally, in 1591, he was presented with the manor of Sherborne, worth about £5,000 a year. With the money acquired in these various ways, and it is to be feared by various ventures partaking of the nature of piracy, he made a splendid figure at Court. The jewels on his shoes alone are said to have been valued at £6,600, and those on his dress at no less than £60,000. He continued stedfast in the work of colonization, and it has been calculated that he spent first and last as much as £40,000 on the expeditions to Virginia alone. In the great year 1588 he commanded a squadron of volunteers against the Armada, and his gallantry was so highly appreciated that he received as his share of the booty as many Spanish prisoners as were allotted to Drake. Next year he served as a volunteer in an expedition nominally undertaken for the purpose of seating Don Antonio, a refugee, on the throne of Portugal. From the point of view of Don Antonio the expedition proved a dead failure; for the Portuguese could not be persuaded to have anything to do with him; but the fleet managed to secure an immense booty, and came back by no means dissatisfied. On his return Raleigh renewed his old friendship with Edmund Spenser the poet by paying him a visit at his home in Ireland, where they composed a great many verses together. During this visit to Ireland Raleigh is said to have planted the first potato ever grown in that country. Hitherto Raleigh's star has been continuously in the ascendant; but soon there came a very serious check to his career of almost unexampled prosperity, a check for which he himself was alone to blame. During the summer of 1592, when he was just forty years old, he was detected in an intrigue with Elizabeth Throgmorton, one of the Queen's maids of honour, a beautiful girl exactly half his age. The Queen was perfectly furious, as well she might be; for Raleigh's conduct was not only a disgrace to her Court, but a personal insult to herself. She promptly sent him to the Tower, where, instead of repenting of his misdeeds, he amused himself with writing absurd letters to Robert Cecil about the Queen, and quarreling with his jailor.

Imprisonment seems, however, to have had a beneficial effect on Raleigh; for in the course of the autumn he married Elizabeth

Throgmorton, who made a very devoted wife. His arrest happened at a most unlucky moment, for he had just been given the command of an expedition against the Spaniards, and had already set sail when he was recalled. This was all the more annoying as the enterprize turned out most successfully; one of the largest of the Spanish treasure fleet, the *Madre de Dios*, of 1,600 tons burden, being captured by Raleigh's own ship, the *Roebuck*. When this great prize, containing jewels, pearls, and amber, had been brought to Dartmouth, the authorities found it quite impossible to keep order. The booty, which had at first been estimated at half a million, dwindled day by day, owing to numerous thefts. Under these circumstances it was absolutely necessary to send for Raleigh, who alone had the requisite authority; so about the middle of September he went down to Dartmouth with his keeper, as a state prisoner, where he was received with acclamations. Soon after he had finished his business at Dartmouth, he despatched Captain Whiddon to make a survey of the Gulf of Mexico and the coast of Guiana, with a view of undertaking a great exploring expedition in person.

Meanwhile, though forbidden the Court, he lived for a couple of years in great splendour in London, with his wife and his infant son Walter. At last, on the 9th of February, 1595, he started from Plymouth harbour on his great expedition, with five ships, and a suitable provision of small craft for river navigation. He made first for Trinidad, where he was entertained with most circumstantial stories about the golden city of Manoa, and men "whose heads do grow beneath their shoulders." At Trinidad too he ingratiated himself with the Indians, by setting fire to a Spanish town, and freeing the Indian captives he found there. He then departed to explore the Orinoco. When he had proceeded three hundred miles up the river, he sent a messenger to the native king of Aromaia, one hundred and ten years of age, with whom he made great friends during his stay. The monarch was very anxious to induce him to make war upon a neighbouring tribe, who had carried away so many of his lady subjects that his chiefs, who used to possess ten or twelve wives apiece, had now to content themselves with three or four; while the enemy's noblemen rejoiced in no less than fifty or even one hundred apiece. Raleigh, however, does not seem to have considered this a sufficient ground for interference on his part. Raleigh took a son of the old king back with him to

England, where he was christened Gualtero with great solemnity. The search for gold had not been prosecuted with any great ardour, but Raleigh came home convinced both from what he saw and heard that there was a great deal of gold in the country. During his homeward voyage he set fire to several Spanish towns which refused to supply him with provisions. On his return in July he was most cordially welcomed, and brought out a narrative of the expedition, under the title of the "Discovery of Guiana."

We now come to the great day of Cadiz, the brightest day in Raleigh's life. The Spaniards ever since the defeat of the Armada had been making ceaseless preparations for another invasion. The king of Spain, to do him justice, was not easily daunted. He constantly fitted out expeditions against England; sometimes, as at Cadiz, we were enabled to nip them in the bud, but on two or three occasions they actually put out to sea, and if the elements had not done our work for us, we should have had to chronicle more than one struggle against a Spanish armada. In 1596, news arrived that a vast fleet was being fitted out in the bay of Cadiz. Drake was dead, but he had a worthy successor in Raleigh, who insisted strenuously on the advisability of destroying the fleet where it was in the harbour. Accordingly an English fleet, with a Dutch contingent, numbering, with transports and tenders, 156 sail, and manned with 8,000 men, set sail from Plymouth harbour on the 1st of June, with sealed orders, under Lord Howard of Effingham, Lord Admiral; Essex, General; Lord Thomas Howard, Vice-Admiral; and Raleigh, Rear-Admiral. On Saturday the 20th the fleet came to an anchor within half a league of Cadiz. Raleigh meanwhile had been despatched with a few vessels, under orders to intercept any Spanish ship that might try to pass out from Cadiz. When he returned, he found Essex in the act of disembarking his soldiers with the intention of making a descent on the west side of the town, and this in spite of a sea running so high, that some of the boats had already been swamped and several men drowned. Raleigh at once saw that such a course was madness, and pointed out to Essex that twenty of the enemy might effectually prevent, in such a sea, the landing of our troops. The officers all joined with Raleigh in the appeal to Essex, whereupon Essex shifted the responsibility for the order on to Lord Howard of Effingham, who was persuaded to withdraw the order for disembarkation, and to move the fleet into the port. By the time the

soldiers had returned on board ship it was night, so the attack had to be put off till Sunday morning. Up to ten o'clock on Saturday night, Essex, Raleigh, and the Lord-Admiral disputed for the honour of leading the van. At length it was settled in favour of Raleigh, who took care to weigh anchor at the very first break of day, and bear down upon the Spaniards well in advance of the rest of the fleet. He was only followed by six large vessels. At his approach several galleons and other ships of war, together with forty great vessels besides, hastened to shelter themselves under a fort, and seventeen galleys were ranged under the walls of Cadiz. Raleigh passed by the galleys, which gave him a broadside; but he only answered by a flourish of trumpets, and passed straight on towards the large galleons, which he battered briskly for three hours, till his ship, always single at the head of all, was in danger of sinking, when he had to row in a skiff to Essex's ship to ask for some small craft, called fly-boats, in which to board the enemy. On his return, in a quarter of an hour's time, he found that Lord Thomas Howard and Sir Francis Vere had contrived to push their ships ahead of his; so he observes: "I presently let slip anchor, and thrusting in between Lord Thomas and Vere, went further ahead than all of them before, and thrust myself athwart the channel, so as I was sure none should outstart me again for that day." At last, having given up all hopes of his fly-boats, Raleigh and the other commanders determined to board the Spaniards direct from their ships, whereupon the enemy let slip their anchors and ran aground, having set fire to their ships. The soldiers tumbled out into the sea in heaps, to use Raleigh's words, "as thick as if coals had been poured out of a sack." About two in the afternoon, or perhaps later, 2,300 men were landed, and quickly routing the Spanish force opposed to them, proceeded at their leisure to sack the city; but Raleigh and the Lord-Admiral took the women and children under their special protection. The citadel of Cadiz capitulated the following day, and paid a considerable ransom, which, with the other booty, was quite sufficient to satisfy the officers and men, and make them anxious for nothing but to go home and enjoy themselves, contrary to the wishes of Essex, who desired to intercept the plate fleet. It was, as we have seen, entirely owing to Raleigh that this great victory did not end in a disastrous defeat. It is also pretty certain that if Raleigh had had command of the expedition instead of Essex and Howard, England would have been the richer by

something like twelve millions sterling, for by gross mismanagement on the part of the general and lord-admiral, the Spaniards were given the opportunity of destroying booty to that amount. Essex, on his return, employed himself in writing "A censure of omissions in this voyage," in which he endeavoured to throw the blame of his own shortcomings upon Raleigh; the country, however, knew better than to believe him. Raleigh was now at the height of his glory; authors dedicated their books to him, painters and sculptors appropriated this sea-fight to his portrait, and medals were struck in his honour. The Queen was incensed against Essex, and began to relent towards Raleigh. On the 1st of June of the next year Cecil took him to Court, and he was completely restored to the Royal favour. With a view to organizing another expedition against Spain, he thought it best to be on good terms with Essex; and before six weeks had elapsed, after his reappearance at Court, he had set sail from this harbour, on an expedition known as "The Island Voyage."

Raleigh in this expedition took Fayall with great gallantry, in the absence of Essex, for whom he had waited three days. Essex accused him of a breach of orders and articles by landing troops without his presence or consent; but finally the quarrel was patched up by the Vice-Admiral. Before returning to England the fleet contrived to secure several good prizes, and had a narrow escape of being wrecked off the Scilly Isles, owing to the obstinacy of Essex, who refused to pay any attention to the warnings given him by the master of Raleigh's ship. Essex was coldly received at Court, and indeed was so much annoyed at Lord Howard of Effingham being created Earl of Nottingham, which as Lord High Admiral gave him precedence, that Essex vowed he would never go to Court again. Raleigh with great disinterestedness suggested a way out of the difficulty. He induced the Queen to revive the office of Lord-Marshal in Essex's favour, which reversed the position of things, and gave Essex precedence over the Lord-Admiral. This of course was very pleasant for Essex, but did not suit the Lord-Admiral at all; so Raleigh, by pacifying Essex, contrived to make an enemy of Nottingham.

In anticipation of a Spanish invasion Raleigh was placed second in command of the fleet, while Essex was in Ireland as Lord-Deputy. In 1600 he was sent with Cobham on an embassy to Flanders; and towards the end of August in the same year he

was made Governor of Jersey. Meanwhile Essex had been examined before the council as to his conduct in Ireland, put in confinement, and deprived of his farm of sweet wines. This treatment made him furious, and in his own house in the Strand he proceeded to mature a plan he had formed in Ireland for removing by force the faction at Court which was hostile to him. Owing to his extreme popularity with the clergy and the people, this plot of his threatened to be very formidable. His treason was of the blackest possible dye. He proposed in the first place to murder Raleigh, Cobham, Cecil, and other prominent men, under the pretence that he was in danger of assassination at their hands, a lie which took in no one. This done, he proposed further to seize the person of the Queen, and, if necessary, to murder her also. The government soon became apprised of the scheme; and Raleigh did all he could to save Essex, and induce him to desist from his mad project. The plot failed, and Essex was arrested. Soon after Essex's arrest Raleigh wrote to Cecil, advising him to be firm with the Queen, and give her no excuse for overlooking the treason. This letter has been variously interpreted, some thinking that he meant to urge the Earl's death, and others that he only intended to oppose his restoration to favour. Raleigh was never bloodthirsty, except against his natural enemies the Spaniards; and we may be well assured that if he did desire Essex's death, he did so only in self-defence. On the 22nd of February Essex was beheaded, and Raleigh, as Captain of the Guard, had to be present; but just before the fatal moment he retired into the armoury, which he afterwards regretted, as Essex on the scaffold expressed a wish to be reconciled to him. The message was not delivered in time; Essex was dead before Raleigh knew of his wish to die in peace with him.

About this time Cecil, who, as Kingsley observes, was "as accomplished a villain as one reads of in history," ingratiated himself with Essex's partizans, and began a treasonable correspondence with James, which narrowly escaped detection by Elizabeth. Raleigh, by no means so wise in his generation, was content to let the future take care of itself; and consequently, on the accession of James in 1603, Raleigh found Cecil first favourite at Court, and himself nowhere. In case any obnoxious person should gain the ear of the new King of England, Cecil took the precaution to provide himself with a number of blank warrants, prohibiting any

one who should be named in them from going to Scotland to escort his Majesty to the English throne. One of these warrants he prudently served upon Raleigh, who lost his temper, and was indiscreet enough to write to the king a letter condemning Cecil's conduct, and explaining that that great minister, though he was now endeavouring to curry favour with Essex's followers, was mainly responsible for the Earl's execution.

From this time Raleigh's fall was decreed. He did not improve his position by asking the King to give him 2,000 men wherewith to make a descent upon Spain; for James was a man of peace, and moreover a great coward. James had been scarcely three months on the throne when Raleigh, gorgeously attired to accompany the King in a riding party, was arrested by Cecil on the great terrace at Windsor on a charge of treason, and forthwith taken off to the council chamber. No doubt a treasonable plot was being hatched by Lord Cobham, his brother, George Brook, and others; and no doubt Cobham and Raleigh had been always on intimate terms; but there is no evidence whatever to implicate Raleigh in the conspiracy, which was to a great extent promoted by the Jesuits, and involved a Spanish alliance, two circumstances sufficient of themselves to prove the absurdity of the charge. Cecil, however, had determined upon Raleigh's ruin, and he contrived with great adroitness to make a transaction which is the best evidence of his scrupulous loyalty the means of effecting his destruction. Raleigh had felt convinced before Cobham's disclosure that some treason was hatching, and had confided his suspicions in a letter to Cecil. This letter Cecil showed to Cobham, who in his anger accused Raleigh of being the principal conspirator. Subsequently he retracted his accusation, but was induced by the hope of pardon to repeat it; then he again retracted, and again repeated it. "Poor mean soul!" as Raleigh calls him. Yet it was on his entirely unsupported evidence that Raleigh was brought to trial at Winchester and condemned. Cecil himself was one of the commissioners appointed to try him, and the jury was of course packed. They were afraid to put Cobham in the witness-box, so they proceeded entirely by his letters and depositions. Sir Edward Coke, who conducted the prosecution, was as usual most insolent and abusive. Raleigh defended himself with the greatest patience and ability; in particular he appealed most eloquently to his services against Spain. He came into court, with the odium attaching to Essex's

death, a very unpopular man; when he left it he had won the sympathy and the admiration of every one, except the judges, the counsel, and the jury. On November the 17th he was told he had only eighteen days to live, and for more than twelve years from this time, during his imprisonment in the Tower, he was kept in constant expectation of death. At first, at his wife's entreaty, he begged his life of James in letters which are not to his credit; but he soon repented of this weakness, and resigned himself as best he could to a sojourn in the Tower. He had numerous influential friends, among them the Queen and Henry Prince of Wales, who remarked that "no one but his father would keep such a bird in a cage."

Raleigh now applied himself in earnest to literature, science, and philosophy. He invented a practical method of distilling salt-water on board ship. He turned his attention to chemical studies, and concocted a great cordial—a mixture of saffron, pounded crabs' claws, and spices, which he fondly imagined to be a specific against every kind of malady. The Prince of Wales, however, died notwithstanding a dose of it, and by his death Raleigh was deprived of a sincere and powerful friend. Celebrated men in every walk of life constantly dined with him in the Tower, and none more frequently than Ben Jonson. In 1614 he published his great work, *The History of the World*, beginning with the Creation and ending a little before the Christian era. It displays an immense amount of learning and research, interspersed with numerous sensible observations and reflections. All through his literary labours he panted for another expedition to Guiana. At last he managed to scrape together enough money to bribe the courtiers—for which purpose his wife had to sell a small estate of her own—and on the 19th of March, 1616, he left his lodgings in the Bloody Tower at the age of sixty-four, attended by a keeper. He was, however, forbidden to repair to Court, or to be present at any great assemblage, lest he should awaken too much sympathy. He now sold everything he possessed, and with the proceeds built his ship, the *Destiny*. A hundred noblemen and gentlemen flocked to his standard, and adventurous ruffians, reckless of everything in the pursuit of gold, arrived in London from the different ports of Europe. These successful preparations put Gondomar, the Spanish ambassador, in a fury, and James vacillated from day to day between fear of the Spaniards and love of gold. His meanness and

treachery are almost inconceivable, even in a Stuart. Under the pretence of satisfying his curiosity, he insisted upon Raleigh furnishing him with a detailed scheme in writing of the proposed expedition; and no sooner had he got it than he sent it off to Spain, in order that the Spaniards might make their preparations accordingly.

The Spanish fleet sent to intercept Raleigh contrived by some blunder to miss him, and he reached the mouth of the Orinoco in safety, but he was so weak that he had to be carried about the deck in a chair, and was unable to take command of the land expedition; so he despatched three hundred soldiers under the command of his son Walter, and his nephew, George Raleigh. Their instructions were to make direct for the gold mines, which were close to San Tome, a Spanish settlement. The governor of this settlement having been furnished with a copy of Raleigh's scheme, was of course on the alert. His spies tracked the English to their night bivouac, and the Spaniards rushed upon them while they were asleep. The English repulsed their assailants, took the town, set fire to it, and killed the governor. Young Walter Raleigh, however, fell in the skirmish. The Spaniards retreated to the woods, and from thence harassed the English. Kemys, one of Raleigh's most trusted captains, though he had special orders to make for the mines at all hazards, was so disheartened at finding Raleigh's scheme had been betrayed to the Spaniards, and at the opposition the English had met with in consequence, that he resolved to abandon the enterprise, and being on his return reproached by Raleigh, committed suicide. Raleigh knew nothing but gold could save him, and that the ill-success of the expedition was his death-warrant. He landed at Plymouth early in June, 1618. James, on the 11th, issued a proclamation denouncing the proceedings at San Tome as a breach of instructions. Raleigh set out for London, but was met at Ashburton by his cousin Sir Lewis Stukeley, Vice-Admiral of Devon, and taken into custody. The two went back to this town, and lodged with Sir Christopher Harris. On the 25th of July, Raleigh, after having endeavoured to escape to France, and then thought better of it, again set out for London, accompanied by Stukeley, where he arrived on the 7th of August. He purposely lengthened out the journey by feigning illness, in order to give himself time to write a full account of the expedition. After another attempt at escape, which was betrayed

by Stukeley, in spite of his having taken a bribe in money and jewels, Raleigh was sent to the Tower on the 9th of August. Gondomar now clamoured loudly for his execution, and James actually proposed sending Raleigh to Madrid, there to be dealt with as the Spanish King should think proper. Gondomar, however, did not close with this enticing proposal; he said he would be quite satisfied to have Raleigh beheaded in England. Raleigh was accordingly beheaded in Old Palace Yard, on the verdict given against him fifteen years before. His execution was appointed for the Lord Mayor's day, when it was hoped that the show usual on that occasion might prove sufficiently attractive to prevent any inconvenient manifestation of sympathy among the populace. Nevertheless, a very large crowd did assemble to witness the basest and meanest of the many base and mean actions for which James is accountable; but, as Raleigh remarked, the denseness of the crowd did not affect him, since for him a place was sure to be reserved. Having vindicated his character in an animated speech, he submitted himself to his fate with unaffected cheerfulness, amid the most intense sympathy of all beholders.

In Raleigh's death England lost a man whose greatness was eminently characteristic of the greatness of his country. He possessed in a superlative degree those qualities which enable us to subdue and to rule over subject races, to overrun the globe, and to render the English name honoured and respected. He was a great man and a true patriot.

THE UNIVERSE.

ABSTRACT OF MR. LANDON'S PAPER.

(Read November 23rd, 1876.)

THE lecturer explained that the motions of the heavenly bodies, subject to the law of mutual attractions, would be greatly modified if the bodies were assumed to move in a *resisting* medium, and that by these modified motions many perplexing astronomical appearances could be explained; *e.g.* the milky way, lines of stars, and the clustering together of stars in groups.

Three causes of resistance were assigned:

"(1) The atmospheres possessed by at least some of the heavenly bodies, though rapidly diminishing in density as the distance from the planet increases, would not entirely vanish, and would therefore produce an infinitely small resistance on other heavenly bodies.

"(2) Scientists generally admit the existence of ether in interplanetary space, and hence probably throughout the universe. The resistance of this substance, though small, must be real.

"(3) Our earth passes through more than one hundred streams of meteors, each stream containing many millions of bodies. These streams move in a direction opposite to that of the earth, and the actual impact of many with the earth forms a fully appreciable cause of retardation, especially when it is borne in mind that meteors weighing many tons have been found on the earth's surface. There is no reason to suppose that our planet meets more meteors than other planets, nor that the solar system possesses more than other stellar systems.

"These retarding causes are placed in order of importance, the last being the most potential; but in considering their effects, it is to be remembered that they are cumulative, and that infinitely small causes, acting during infinitely large portions of time, produce finite effects."

The lecturer then explained that the term "system of heavenly bodies" could be applied to comparatively small numbers of such bodies, where vast spaces, almost void, stretched between them and the rest of the universe, and that their *relative* motions could be calculated independently of such external bodies, though in considering their *absolute* motions these external influences played an

important part. In calculating the relative motions of such a system, the centre of gravity was taken as a point of reference, since this point remained fixed. It was also possible, by mathematical methods, to determine a plane such that all the forces of the system resolved parallel to it would give a maximum resultant. As this plane was invariable, it formed a convenient plane of reference; and just as the centre of gravity might be regarded as the *mean point*, so the invariable plane might be regarded as the *mean plane* of the system. The orbits of the bodies of the system might now be regarded as approximately ellipses with the centre of gravity as focus, which orbits at the same time oscillated about the mean plane. If the bodies moved in vacuo, their orbits, though constantly varying, would go though periodic changes, every phase being reproduced after certain fixed periods of time; but if the bodies moved in a resisting medium, every element of the orbit would constantly diminish, and two marked results would follow.

1. *Centralization*, by which all the bodies of the system would be constantly drawn to the centre of gravity, and so *clustering* would be developed.

2. *Applanization*, by which the bodies would constantly tend towards the mean plane.

Hence clusters, which would be primarily globular in form, would tend to the form of a disc.

Observation had shown that this form held with regard to (1) the solar system, and (2) the stellar system, as seen in the milky way. The appearance of constellations in lines naturally followed from the constellations having assumed a disc-like arrangement, and man's observing these discs edgewise.

The remainder of the lecture dealt with the probable origin of heavenly bodies, and their development into orders of systems. Arguments were adduced in support of the theory that the planets of the solar system had been originally united with the sun in one immense mass, and had been thrown off from it while cooling, and that by the process of centralization they would be ultimately drawn into it again. The theories of Wright, Kant, and Lambert, as to orders of suns rising in degree to one grand central sun, were examined, and reasons given for doubting the existence of such central suns, while it was admitted that the tendency of evolution was to develop such a system.

Dr. JONATHAN HEARDER.

Jonathan Nash Hearder was for many years one of the most active and energetic contributors to the scientific department of the Society's pursuits.

He was born at Plymouth in 1809. At an early age he acquired great dexterity in the use of tools, and was enabled to produce for himself electrical and chemical apparatus, wherewith he acquired knowledge experimentally, and which eventually led on to the prosecution of lengthened investigations of a very important character.

He was soon distinguished for his ability in the production of electrical machines of very remarkable efficiency. He was also very successful in devising electrical apparatus, and in the execution of experiments illustrative of the phenomena of electricity. At the early age of seventeen he gave courses of lectures in Plymouth and at Exeter on electrical and chemical subjects; and from that time until comparatively a recent period he continued to give lectures throughout the Western Counties and elsewhere, which were distinguished for their eloquent lucidity of explanation and brilliancy of experimental illustration. His bright, cheerful style of treatment of difficult subjects had such a charm for his audience that he gained adherents to the pursuits of science, and sealed the fate for life of at least some of his young hearers. He was a thoroughly scientific man; no mere show lecturer, but one who pursued science for its own sake. In his lectures he always challenged discussion; and it was no uncommon thing in his early days for the discussions to excite such interest as to lead to repeated adjournments.

His early-acquired dexterity of manipulation stood him in good stead; for at the age of twenty-one he lost his sight through the accidental explosion of silver fulminate; but his perseverance was such that he continued to make his own apparatus at the lathe, and his associates have regarded with envy and admiration pieces of work that he could turn out, quite beyond their capability. It was not easy for a stranger to believe that he was blind, looking at his movements behind the lecture table, well covered with complicated apparatus.

His lectures at the Athenæum were always looked forward to, not only by the members, but also by outsiders, with interested

anticipation; and the enjoyment of them was considerably enhanced by his good-tempered, trenchant style of dealing with opponents in the discussions following, not only his own, but others' lectures. Many of his Athenæum lectures were characterized, not merely by his ability in treatment, but also by their great amount of laborious preparation, and for thoroughness of experimental illustration, rarely, if ever, excelled.

While young he was distinguished for almost superabundant energy. To his graver associates his scientific pursuits seemed to absorb his whole attention; but with others, in cricketing, boating, fishing, swimming, he was recognized as first amongst the first.

For some years after the loss of his sight he kept a school, and many of his old pupils have good reason to be thankful for and to remember, the energy with which he pressed them forward with their studies. He was no mean musician, and was a considerable contributor to the local periodical and newspaper literature.

At the time that Sir W. Snow Harris's lightning conductor for the protection of ships was introduced, he took a very active part in combating a very energetic opposition that was raised against its adoption. By public discussions of a very lively character, and by newspaper correspondence, he did very much in diffusing a large amount of very useful knowledge of electrical matters.

Amongst his earliest and most remarkable lectures were some on combustion, which were not only brilliantly illustrated but also thoroughly explained. His early recognition of the importance of the subject has been most completely verified by the successful developments of chemical manufactures, and by the history of marine navigation. Dr. Hearder continued to give great attention to the subject, both practically and theoretically. The importance of some of his investigations has hardly even yet been properly recognized; for his investigations of the conductivity of metals to heat and to electricity, and of the phenomena of combustion *in vacuo*, were extensive and profound.

When lucifer matches were first introduced, and were selling at one shilling per box, he took up the manufacture; but subsequently turned his attention to the making and introduction of Arnott's stoves, in which he made several important improvements.

After his father's death he continued the family business, that of the manufacture of fishing tackle, on which matter he was the authority of the district.

From an early period he devoted much attention to medical electricity, and introduced a very admirable modification of the induction coil machine, which has obtained considerable celebrity.

He experimented largely on the production of power by electricity, and on the utilization of the electric light, and was an early, if not the earliest, proposer of its use for military and naval purposes. In concert with the local authorities he showed the possibility of exploring the country around at night by the use of the light from the top of the Devonport Column. In 1846 he exhibited at the Royal Cornwall Polytechnic Society an arrangement of primary and secondary coils, with which sparks were obtained in air, and discharges several inches long through rarefied air, and with which Leyden jars were charged. In 1853–4 he brought out an induction coil, which was a great improvement on the Ruhmkorff. He was one of the earliest advocates of the use of submarine telegraphs, and invented a form of cable which with some modification was used as a sea-cable. The subjoined list of papers published by him will give some faint idea of his industry. His lamented decease leaves a vacancy in the ranks of the members of our Society which will prove very difficult to fill.

"On Arnott's Stoves." Read at the Plymouth Meeting of the British Association, 1841.

"On a New Magnetometer, a New Rotating Electro-motive Engine, and a New Thermo-Electrometer." Royal Cornwall Polytechnic Society's Report, 1844.

"On a New Form of Medical Galvanic Machine, with Double Index Graduation." Royal Cornwall Polytechnic Society's Report, 1846.

"Some New Effects of Induction Apparatus for Medical Purposes." *Ibid*, 1848.

"A New and Powerful Cast Iron Magnet." *Ibid*, 1848.

"A New and Powerful Form of Static Induction Coil." *Ibid*, 1856.

"A New Arrangement of the Induction Coil." Philosophical Magazine, 1856.

"Some New Statical and Thermal Effects of a Powerful Induction Apparatus." Royal Cornwall Polytechnic Society's Report, 1856.

"New Form of Telegraph Cable intended to reduce the effects of Inductive Action." Royal Cornwall Polytechnic Society's Report; "Philosophical Magazine," 1859.

"Electrical Conductivity of Metals." "Philosophical Magazine," 1860.

"The Inductometer." Royal Cornwall Polytechnic Society's Report, 1860.

"On the Imperfection in the Present Mode of Fitting Lightning Conductors." Devonshire Association Transactions, 1863.

"New Deep-Sea Pressure Gauge." *Ibid*, 1862.

"Some Experiments with the Electric Light." Devonshire Association Transactions, 1865.

"Remarks on the Cost of Light from Magnesium, as Compared with other sources of Illumination, with an Account of some New Inflammable Explosive Compounds of Magnesium." Devonshire Association Transactions, 1865.

"Some Experiments to determine the Rate of Magnetic Development in Iron whilst under the action of Electrical Currents." Devonshire Asssociation Transactions, 1866.

"Review of Professor Tyndall's Recent Investigations concerning Sensitive Flames." Plymouth Institution Transactions, 1868.

"Recent Earthquakes and Volcanic Eruptions." *Ibid*, 1869.

"The Fulgurator. A New Arrangement of Leyden Jars for the Production of Electro Sparks of Enormous Length." Devonshire Association Transactions, 1870.

"On the Degeneration of our Deep-Sea Fisheries." Devonshire Association Transactions, 1870.

"Aurora Borealis." Plymouth Institution Transactions, 1871.

"Electro Therapeutics." British Medical Association Transactions, 1871; Devonshire Association Transactions, 1872.

"Guide to the Fishing of Plymouth and Neighbourhood."

"Application of Cast Iron as a Substitute for Steel in the Construction of Permanent Magnets."

"On the Comparative Power of Cylinder and Plate Electrical Machines." Plymouth Institution Transactions.

"Treatise on Medical Magnetism."

R. O.

BOTANICAL NOTICES.

Habenaria viridis (Br.) grows somewhat sparingly on Smear Ridge, near Peter Tavy, flowering in July. I am not aware that it has been noticed before on the west side of Dartmoor; it has been found at Sidbury by Miss Hunt; at Chudleigh by the Rev. G. B. Warren; and the Rev. J. F. Ravenshaw says, "Dartmoor." *Orobanche amethystea* (Thuil.), once tolerably plentiful at Tregantle, but destroyed during the formation of the new Forts, still lingers on the rocks under Plymouth Hoe: I have found a few plants during three successive summers.

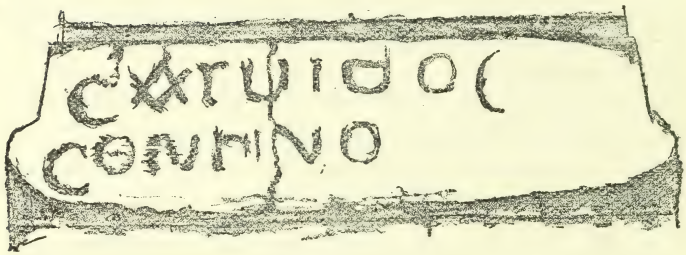
Convallaria majalis (Linn.), as a *truly wild* plant, grows in considerable abundance in the woods under Shaugh Beacon. I believe it has not previously been recorded as a Devonshire plant, although plentiful in most gardens.

Francis Brent.

THE INSCRIBED STONES AND ANCIENT CROSSES OF DEVON.

PART II.

BY MR. C. SPENCE BATE, F.R.S.



LUSTLEIGH STONE.

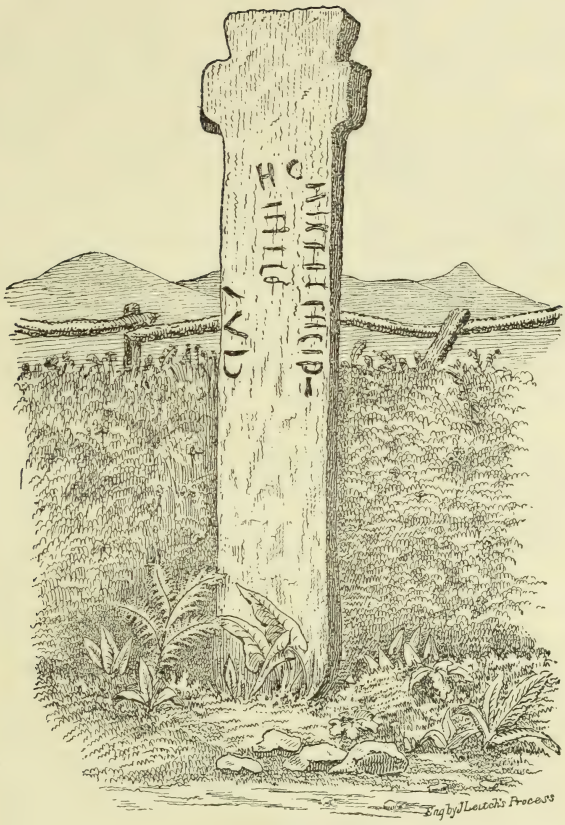
This stone is figured in Lysons' *Magna Britannia*, vol. v. (Devonshire) p. 309, and is copied therefrom in his *Inscriptiones Britanniæ Christianæ* (Devonshire), p. 11, by Hübner, who says, "Lectio incerta."

It lies at this time as when Lysons observed it, at the door of the main entrance into Lustleigh Church.

The stone is four feet long by fourteen inches wide; the extreme ends are covered by the two pilasters that form the doorway.

The door is double, and as one half only appears to be generally open, the stone at the eastern end is the more worn and polished, so that the inscription is gradually becoming less distinct, the last letter in the second row being entirely obliterated since Lysons described, in 1822.

Having recently examined the stone, and compared the drawing then made with care upon the spot with Lysons' figure, I feel assured that the two first letters of the inscription represent "c" and "a." The former of these Lysons distinctly figures as "d"; but the markings on the surface of the stone above the body of the letter appear to be without design, and it accordingly reads, "catvidoc conrino," to which Lysons adds the letter "c" as the termination of the second word. The stone lies imbedded in mortar outside the wooden door-sill of the church, and is trodden by all who enter.



SOURTON CROSS.

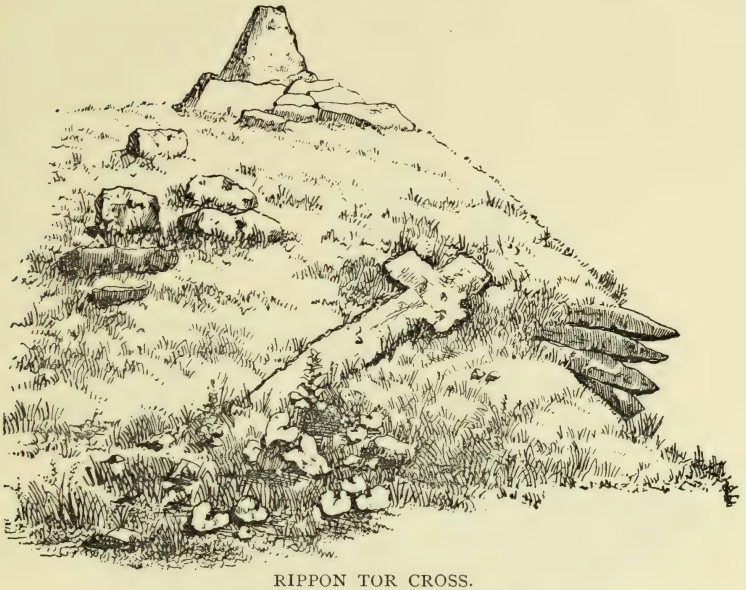
Near the village of Sourton, on the high road from Tavistock to Okehampton, is a large cross. It stands eight feet two inches above the ground, and is one foot five inches wide. The arms of the cross project but a few inches beyond the shaft. It is a square-cut struc-

ture of the simplest type, and resembles the moorland crosses of the earliest dates.

On the four sides below the cross are cut the letters H. L. T. O., which refer to boundaries of Hatherleigh, Lydford, Tavistock, and Okehampton. On the western face of the stone, that on which the letter "H" is engraven, the remains of an almost illegible inscription, graven in three lines, traversing the perpendicular direction of the stone, are still to be distinguished. The very slight extent by which the arms project, being only about an inch beyond the widest part of the stone, and the oblique direction at which the sides incline inwards to the base of the arms, are strongly suggestive that this cross was executed out of an old inscribed monument.

In the village of Sourton, near the church, still exists the pedestal on which a cross once stood, but of which the inhabitants appear to have no recollection.

Lying on the ground, and built into the wall of a neighbouring house, are several (I counted eleven in all) small stone pillars, that may have formed part of some structure over the cross.



RIPPON TOR CROSS.

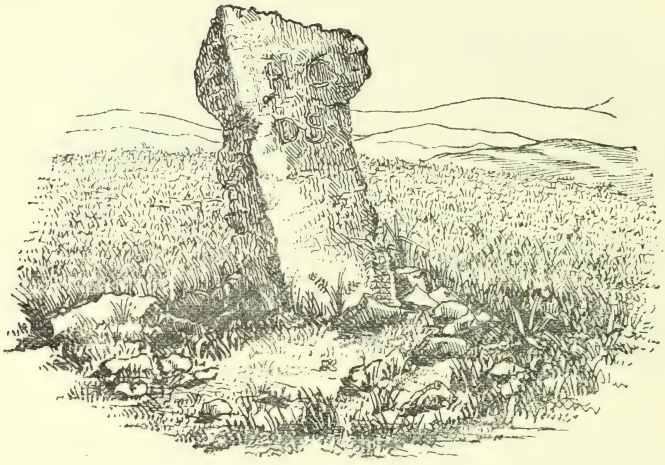
On the northern side of Rippon Tor, on the face of the slope, overgrown with heather and wild thyme, there lies embedded in the turf an ill-cut cross. On removing the moss and plants that are struggling to entomb it, I found it to have been cut in relief upon the mass of granite that lies below.

This cross could not have been intended, as most of the moorland crosses undoubtedly were, to serve as guiding the pathway over a desolate region. I therefore believe that it was sculptured at a period when the sign of the cross was thought to bring a blessing, as a symbol of good that should drive away all evil from a spot that had probably been much noted for unhallowed rites.

I think there can be but little doubt that many of the older moorland crosses were placed in accordance with an order from Pope Gregory, that the symbol of the Christian religion should be engrafted on the records of heathen superstition.

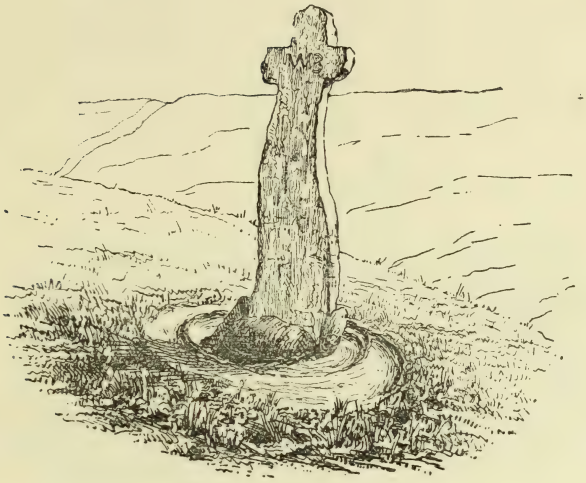
On Rippon Tor are two or three large cairns, from one of which a causeway leads to an overhanging rock. May not this last have been the scene of human holocausts, and the causeway the path by which the victim was carried to the cairn?

Farther down the hill there is a large logan stone.



HAMILDON CROSS.

This relic of a past age stands on the western brow of Hamildon Down, between Broad Barrow and Hamildon Tor. It is one of the most rudely-executed crosses on the moor. For many years it was partially buried in the soil on which it fell, and in 1839 was replaced as a boundary mark defining the extent of the Duke of Somerset's property in this direction, his lordship having engraved on it the letters H.C., D.S., 1839, for Hamildon Cross, Duke of Somerset.



VITIFER CROSS.

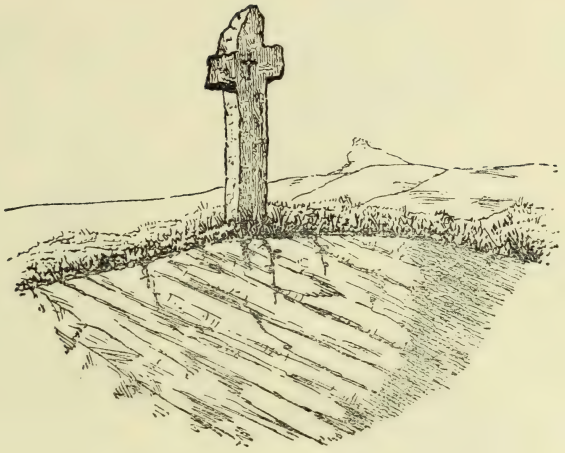
This is a rudely-executed cross about four feet six inches in height; it is broader at the base than at the summit, and the shaft is crooked, and planted sloping in the ground. The letters W.B. are carved on one side.

This cross is situated below the King's Oven, formerly known as "Ye Furnum Regis," and not far from one of the most extensive tin mines and stream works on the Moor, which bears the same name. From its appearance it should be among the older forms on the Moor.

HUNTINGTON CROSS

Is a tolerably evenly-formed cross, about four feet eight inches high, with arms of tolerable proportions. It is situated on the Avon, and forms a bound-mark of the forest limits.

It stands near a very extensive ancient tin stream work, as well close to the track-road that is known as the Abbot's Way.

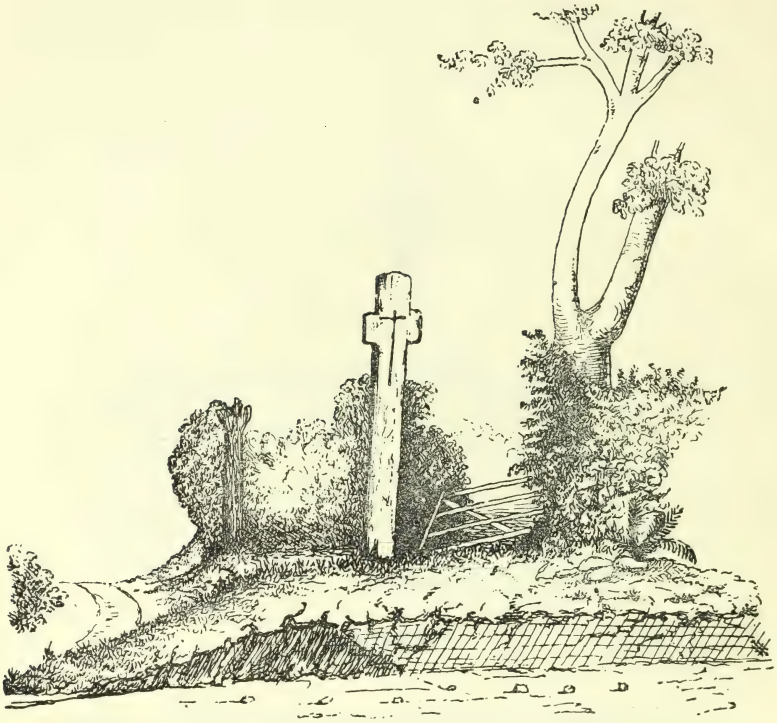


WHITCHURCH.

On Whitchurch Down, on the very edge of a quarry, stands an old rude square-cut granite cross. The eastern face is hewn flat. The opposite side is very roughly hewn.

In the centre of the cross is a small cross deeply engraved.

The height of the stone is about four feet six inches, and the length of each arm about nine inches.



MEAVY BRIDGE CROSS.

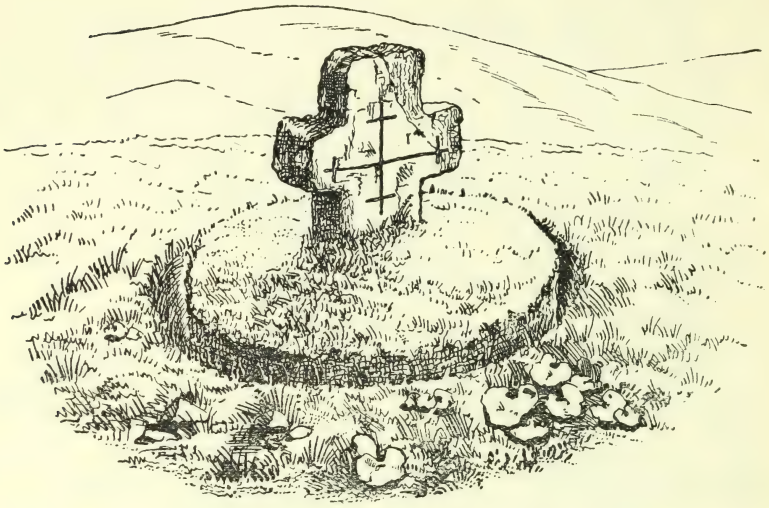
On the road from Shaugh to Meavy, just where the road to Sheepstor turns up the valley by the side of the Meavy river, stands a rudely cut granite cross. It is upwards of six feet in height. The arms are short; and on the western face, being that which is directed to the road, is engraven a simple cross, the arms being above the centre of those of the outer cross, while the shaft reaches considerably below the lower line of the arms.

HORRABRIDGE CROSS.

On the road from Horrabridge to Sampford Spiney, where it is crossed by a road from Walkhampton to Tavistock, is a roughly hewn granite cross about six feet in height. It has the western face, being that directed towards the road, cut smoother than the other sides, with a linear cross engraven on it, the shaft being considerably longer than the arms.

The head of this stone has been slightly fractured.

This much resembles Meavy Bridge Cross, but is somewhat more roughly hewn. It stands on the same line of road between Walkhampton and Meavy.



CADOVER BRIDGE.

At Cadover Bridge stands a cross that had long been fallen.

During the military manœuvres of 1873 the soldiers replaced it, burying the shaft deeply in the soil, and cutting a trench round it.

Close outside the trench they placed a directing-post, with a hand pointing to the river Plym just below. On the post was written, "Watering-place of the 1st Battery of Artillery."

The cross is squarely cut, and roughly hewn. It is about nineteen inches above the ground, the arms are about six inches long, and the edges are weathered round.

The face of the stone, which now stands south, is flat, and on the surface is engraved a cross which has the extremity of each limb intersected by a line that forms another cross.

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AND

Devon and Cornwall Natural History Society.

1876-77.

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Borland, Mrs. R., Emma Place, Stonehouse

Dawe, Miss, 8, Portland Villas

Issanchou, Mdlle., 1, Leigham Terrace

Kendall, Miss A. C., Plymouth High School

Loye, Mrs., 7, Osborne Place

Parker, Miss S., Torrington House
Pomeroy, Mrs. and the Misses, 1, Edgcumbe-street, Stonehouse

Rumble, Miss, Courtenay-street

Snell, Miss, Chapel-street, Stonehouse
Snell, Miss J., Chapel-st., Stonehouse

JUNIOR ASSOCIATES.

Varnier, Alex., The Crescent

Snell, Ernest, Lipson Terrace

SECRETARIES' REPORT.

1876–77.

The Secretaries present the following Report of the proceedings of the Session.

The subjects discussed by the Society were—

Oct. 12.	Inaugural Address.	
„ 19.	The Hedge-Banks of Devon and Cornwall	Mr. T. A. Cragoe, F.R.G.S.
„ 26.	Mind and Conscience in our Poor Relations	Rev. W. Sharman.
Nov. 2.	The Religious History of Plymouth—Nonconformity	Mr. R. N. Worth, F.G.S.
„ 9.	Shakespeare's Richard II. and Marlowe's Edward II.	Mr. Montague Bere, Q.C.
„ 16.	Hannibal—Man and Warrior	Rev. H. Overy, B.A.
„ 23.	The Universe	Mr. F. G. Landon, M.A.
„ 30.	Geography of Devonshire in relation to Health	Dr. William H. Pearse.
Dec. 7.	Experiences among Emancipated Slaves	Rev. W. Sharman.
„ 14.	The Physiological Basis of Music	Dr. Meeres.
„ 21.	The Breathing Organs of Fishes	Mr. J. K. Bond, B.A., F.L.S.
Jan. 11.	Comets	Dr. Merrifield, F.R.A.S.
„ 18.	Colour in Nature and its relation to Practical Pictorial Art	Mr. A. Shelly.
„ 25.	The Hydrogeology of the Plymouth District	Mr. James C. Inglis, C.E.
Feb. 1.	Are the conclusions of Induction certain, or only probable?	Mr. R. Smith.
„ 8.	The Epicurean and the Stoic—the Modern Man of Pleasure and the Puritan	Mr. W. F. Collier.
„ 15.	The Factory and Workshops Acts Commission, 1875–6	Sir George Young, Bart.
„ 22.	Language—the contrast in its development in Man and Brute	Rev. J. Erskine Risk, M.A.

Mar. 1.	The Kindergarten . . .	Rev. F. E. Anthony, M.A.
„ 8.	The Progress of Sanitary Science .	Mr. Geo. Jackson, F.R.C.S.
„ 15.	A Plea for the Credulous . .	Rev. J. M. Hodge, B.A.
„ 22.	Some Points in the Physiology of Vision	Mr. W. Square, Jun., F.R.C.S.
„ 29.	The Life of Sir Walter Raleigh .	Mr. R. Collier.

The average attendance at the lectures has been 73. Seven members, thirteen associates, three lady associates, and one junior associate have joined the Society during the year, the present numbers being 79 members, 101 associates, thirteen lady associates, and two junior associates.

We are sorry to have to state that our highly-esteemed and industrious member Dr. J. N. Hearder, who was obliged from illness to send us at our last annual meeting his resignation of the office in the Society which he had held for many years, died not long after.

The Conversazione usually held at the commencement of the session was given up in consequence of the meetings of the Church Congress in this town, but we had one at the beginning of January, at which a selection of vocal and instrumental music was given, under the direction of Mr. S. Weekes. Mr. W. Square, jun., showed some transparencies, principally illustrative of Egypt, and a tasteful selection of pictures, supplied by Mr. Hall and the Plymouth Art Club, was exhibited.

A very agreeable and well-attended excursion of the Society to Tavy Cleave took place in July.

At the Anniversary Meeting the President read a paper on "The Use of Opium in the East."

The Transactions of the Society have continued under the editorship of Mr. C. Spence Bate, F.R.S., as from the commencement of the fourth volume.

The Curator of the Library reports as follows:

"During the past year many volumes have been added to the Library of the Plymouth Institution. A few of these have been given by persons connected with the Society; others have been obtained by purchase; and a considerable number have been received in exchange for the yearly portion of the 'Transactions.'

"Major-General Nelson, R.E., long connected with the Society as a corresponding member, has kindly presented a valuable folio vol.

of plates to Cuvier's 'Regne Animale,' and a copy of a pamphlet 'On some Points in the Histology of Certain Species of Corallinaceæ,' written by himself, in conjunction with Professor Duncan. Another corresponding member, Mr. G. Wareing Ormerod, has shown his abiding interest in the Society by giving a copy of his recent interesting work, 'Archæological Memoirs relating to the East of Dartmoor;' as also of his account of 'Rude Stone Remains situate on the easterly side of Dartmoor;' and of his 'Supplement to Second Edition of Index to Transactions of Geological Society of London.'

"The President for the past year, the Rev. S. Beal, has presented a copy of his 'Report on the Buddhist Tripitaka.' Among the lecturing members Mr. J. Brooking Rowe has given a large number of vols. of the 'Early English Text Society;' and a copy of his 'Ecclesiastical History of Old Plymouth.' Mr. Brent, 'Wilson's Jussieu's Elements of Botany;' 'Smith's Introduction to Botany,' edited by Macgillivray; G. E. Smith's 'Catalogue of Rare or Remarkable Phænogamous Plants of South Kent;' and 'Hall's Flora of Liverpool.' Mr. W. Square, several numbers of 'Proceedings' of the Royal Geographical Society. Mr. W. G. Tweedy, a volume of the 'European Magazine,' containing in the number for June, 1798, an interesting account of the Subterranean Cavern at Stonehouse; and Dr. J. Merrifield, a number of Weather Charts.

"Dr. Wyatt, of Adelaide, has forwarded 'Schomburgh's Botanical Remiscences of British Guiana;' 'Flora of South Australia;' 'Catalogue of Plants in the Adelaide Botanic Garden;' and 'Harcus's South Australia.'

"Dr. Hayden, Western States geologist, has sent several vols. relating to the Government Survey of the Territories. The British Association have presented their Report for 1875; the Geological Society of London, Nos. 126–129 of their 'Quarterly Journal;' the Zoological Society, Part 4, 1875, and Parts 1–3, 1876, of their 'Proceedings;' Royal Dublin Society's 'Journal,' Nos. 1–23, vol. xiv.; Devonshire Association 'Transactions,' 1876; Royal Institution of Cornwall 'Journal,' No. 18; Royal Cornwall Polytechnic Society's 'Reports,' 42 and 43; Royal Cornwall Geological Society, several 'Reports,' and parts 1 and 2 of vol. ix. of 'Transactions;' Bristol Naturalists' Society's 'Proceedings,' vol. i. part 3; Norfolk and Norwich Naturalists' Society's 'Transactions,' vol. ii. part 2; Berwickshire Naturalists' Club 'Proceedings,' part 3 of vol. vii.;

Belfast Field Club, 'Reports and Proceedings,' 1874–75, 1875–76; Somerset Archæological and Natural History Society, 'Proceedings,' vol. xxi., 1875; Literary and Philosophical Society of Manchester, 'Memoirs,' vol. v. (third series); 'Proceedings,' vol. xv., 1875–76; 'Catalogue of Books in Library.' Literary and Philosophical Society of Liverpool, 'Proceedings,' vol. xxx.; Winchester and Hampshire Scientific and Literary Society, 'Proceedings,' vol. ii. part 2. The Natural History Society of Tuscany have forwarded portions of their 'Atti;' and the University of Christiania, a number of scientific works.

"During the past year the Plymouth Institution has entered into correspondence with three additional societies—the Royal Botanical Society of Edinburgh, the Royal Cornwall Geological Society, and the Somerset Archæological and Natural History Society.

"The following works have been purchased: 'Ptolemy's Geography;' 'Zoological Record,' 1874; 'Geological Record,' 1874; 'Transactions of the Geological Society of Cornwall,' vol. v.; vol. xxx. of 'Palæontographical Society's' Series; 'Monograph of British Aphides,' vol. i. (Ray Society); 'Maclean's Trigg Minor,' part 12; 'Carrington's Plymouth and Devonport Guide;' 'Burt's View of the Commerce of Plymouth,' 1816; 'Lipscombe's Journey into Cornwall,' 1799; 'Rowe's Perambulation of Dartmoor;' 'Banks's Plymouth and Devonport Flora;' 'Kingsbridge and Salcombe Historically and Topographically Depicted,' 1819; 'A Walk round Mount Edgcumbe,' 1821; 'North's Week in the Isles of Scilly,' 1850; Blight's Two Days in Cornwall with the Cambrian Archæological Association, 1862;' 'Borlase's Historical Sketch of the Tin Trade in Cornwall;' 'Cumming's Churches and Antiquities of Cury and Gunwalloe'; 'Harvey's Mullion;' 'Oliver's Pendennis and St. Mawes;' 'Stokes's Vale of Lanherne,' 1853; and 'Bottrell's Traditions and Hearth-side Stories of West Cornwall,' 2 vols.

"One new serial, 'The American Naturalist,' has been subscribed for. As in past years many volumes of serial works have been bound and placed on the shelves."

(*Signed*)

WM. ADAMS,
W. SQUARE, Jun., } Hon. Secs.

TREASURERS' REPORT.

1876–77.

The annual subscriptions from Members and Associates during the past year amount to £197 18s. 6d., in addition to £8 8s. due for arrears, showing, notwithstanding several withdrawals, an increase of £21 upon the receipts under these heads last year. The sums paid for rent of the Hall are also in excess of those received for the last four years.

On the other hand, the expenditure has been large, owing to the expense incurred in the repair and renovation of the Building. The total payments on this account have reached £200 18s. 1d., the amount, within a few shillings, of the estimate of the Curator of the Building. It was thought that it would have been necessary to borrow the whole of the money required for this purpose, and the Council authorized your Treasurers to overdraw the account at the bank to this extent. Fortunately, however, the anticipations of your Treasurers were not realized, and they have not been obliged to carry out their instructions to the full, as with the money in hand from last year, and the increased revenue, the adverse balance is now only £109 11s. 4d. The old debt of £100 still of course remains due, and the total liability of the Society at the present time is £209 11s. 4d., instead of £300 or thereabout, as was expected. The other items do not call for remark, the expenditure on the whole being much as usual. The donation of Dr. Holmes, referred to in last year's Report, has been laid out in the purchase of the publications of the Early English Text Society, to complete, as far as possible at present, the set in the Library. If the receipts continue as at present, and economy is observed, it will not, we think, be difficult to make an annual reduction of the debt, and extinguish it in the course of three or four years.

J. BROOKING ROWE,
S. CATER, } Treasurers.

Dated 2nd April, 1877.

BALANCE SHEET

OF

The Plymouth Institution and Devon and Cornwall Natural History Society,

For the Year ending 3rd April, 1877.

To		£	s.	d.	By		£	s.	d.
	Repairs to Building	200	18	1		Balance in hand	30	11	10
	Reports and Illustrating	48	15	0		Annual Subscriptions of Members and Associates, at 21/-	190	1	0
	Library and Binding	37	1	7		Ladies' and Junior Associates' Subscriptions, at 10/6	7	17	6
	Salaries and Commission	18	14	0		Arrears of Subscriptions	8	8	0
	Lighting and Warming	13	16	5		Admissions	1	11	0
	Conversazione	7	16	11		Rent of Hall	19	1	6
	Rates, Taxes, and Fire Insurance	17	6	0		Sale of Bookcase, &c.	1	11	1
	Incidentals, Postages, and Petty Payments	5	15	4		Balance	109	11	4
	Repairs, Ordinary	6	12	5					
	Interest, Bank	3	16	10					
	Printing	7	9	2					
	Museum	0	11	6					
		£368	13	3			£368	13	3
	Balance down	109	11	4					

We have examined the foregoing Cash Account and Balance Sheet, and compared them with the Vouchers, and find the same correct,

J. BROOKING ROWE,
S. CATER, } *Treasurers.*

FRAS. BRENT,
R. N. WORTH, } *Auditors.*

Dated 4th April, 1877.

An ABSTRACT from the METEOROLOGICAL REGISTER, from 1st January, 1875, to 31st December, 1876, kept at the Navigation School, Gascoyne Place, Plymouth (Lat. 50° 22½′ N., Long. 4° 7¼′ W.), by JOHN MERRIFIELD, LL.D., F.R.A.S., F.M.S.

MONTH.	BAROMETRICAL PRESSURE REDUCED TO MEAN SEA LEVEL AT 32° FAH.			TEMPERATURE.			HYGROMETER.				RAINFALL.		DIRECTION OF WIND AT 8 A.M.				
	Average Barometer	Maximum for Month.	Minimum for Month.	Average Maximum in shade.	Average Minimum.	Average temperature.	Average dry Bulb.	Average wet Bulb.	Average dew Point.	Average humidity Saturation, 100.	No. of days on which not less than ·01in. fell	Quantity for the month in Inches.	From N. to E.	From E. to S.	From S. to W.	From W. to N.	Calm.
1876																	
January .	30·260	30·634	29·534	45·74	35·53	40·64	40·12	38·95	37·44	90	11	1·15	11	10	5	1	4
February .	29·844	30·373	29·442	48·39	39·05	43·72	42·57	41·32	39·81	90	21	4·25	7	5	10	5	2
March . .	29·621	30·172	28·647	49·35	40·90	45·13	42·13	40·40	38·27	86	25	3·57	7	3	8	13	0
April . .	29·863	30·520	28·871	54·27	42·17	48·22	47·39	45·58	43·57	87	20	3·81	5	8	6	8	3
May . .	30·147	30·455	29·703	59·44	43·66	51·55	51·71	47·58	43·37	73	3	·13	16	1	3	8	3
June . .	30·013	30·253	29·737	66·71	51·34	59·03	58·57	54·87	51·56	78	16	1·64	5	5	7	9	4
July . .	30·118	30·438	29·703	72·21	57·62	64·92	64·28	60·42	57·22	78	9	1·25	6	1	10	8	6
August. .	29·970	30·329	29·305	62·96	56·53	63·25	61·96	59·20	56·83	83	12	4·43	11	2	10	5	3
September.	29·812	30·364	29·298	63·00	50·98	56·99	55·64	54·34	53·10	91	21	5·31	5	3	12	10	0
October .	29·879	30·283	29·241	58·71	50·61	54·66	53·25	51·92	50·60	91	17	3·78	14	5	7	3	2
November.	29·846	30·415	29·104	53·27	40·62	46·95	45·09	44·17	43·11	92	16	4·99	11	5	7	4	3
December .	29·422	30·178	28·418	51·50	42·35	46·93	46·06	45·28	44·39	94	26	8·87	2	11	8	8	2
Average for 1876	29·900	30·368	29·250	57·71	43·95	51·83	50·73	48·67	46·61	86	197	43·18	100	59	93	82	32
Average for 12 Years . .	29·945	30·391	29·318	58·75	45·19	51·97	51·15	49·41	47·28	86	177·75	36·98	74·8	70·3	109·2	86·7	24

The observations are made at eight a.m. The Rain Guage is by Casella, and 8 inches in diameter. Its top is 9 feet 2 inches above the ground, and 75 above the mean level of the sea. The instruments have all been supplied by the Meteorological Committee of the Royal Society, compared at Kew, and the index error supplied to each.

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